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5500 Centrifuge with Hydraulic Backdrive Operations Manual

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SECTION I

INTRODUCTION

OVERVIEW
HUTCHISON HAYES HIGH "G" CENTRIFUGE MODEL 5500

This Service Manual describes the centrifuge, and lists instructions for the installation, operation, and maintenance requirements.

The basic purpose of this centrifuge is to separate the liquid and solids from the fluid feed (slurry.)

A stainless steel rotating bowl, driven by a 60 H.P. electric motor is used to centrifuge the slurry; that is to sling the solids against its inside wall surface while a stainless steel screw conveyor (faced with hard tiles) gathers and conveys these solids to a central discharge area.

The conveyor is driven at a slightly slower RPM through a planetary gear reducer.

The liquids migrate to the front end of the machine and are dispelled through four (4) adjustable plate dam openings, to a central discharge area.

For a more comprehensive description of how the centrifuge operates, see the Operation Section of this manual.

5500 INDUSTRIAL MODEL CENTRIFUGE

DATA

Normal Bowl Centrifugal Force:	2118 G's
Normal Bowl Operating Speed:	3053 RPM
Normal Conveyor Operating Speed:	3022 RPM
Max. Bowl Centrifugal Force:	3110 G's
Max. Bowl Operating Speed:	3700 RPM
Max. Conveyor Operating Speed:	3663 RPM
GB-100 Gear Unit	
Max. Output Shaft Torque:	36,000 LB. IN.
Max. Pinion Shaft Torque:	363.6 LB. IN.
Ratio:	99.28 :1
Differential Speed:	31 RPM
Motor Speed:	1750 RPM
Motor Sheave:	14" O.D.
Centrifuge Sheave:	8.025" O.D.
Rated Solids Output:	12,000 LBS./HR.
	35.500 (MAX.)
Bowl Inside Diameter:	16 IN.
Bowl Length:	55.56 IN.
Package Weight Empty: (Floormount Unit)	7,365 LBS.

OILFIELD MODEL (SKID MOUNTED)

Normal Bowl Centrifugal Force:	2118 G's
Normal Bowl Operating Speed:	3053 RPM
Normal Conveyor Operating Speed:	2996 RPM
Main Drive Motor	60 HP
BackDrive Motor	60 HP
Max. Bowl Centrifugal Force:	3110 G's
Max. Bowl Operating Speed:	3700 RPM
Max. Conveyor Operating Speed:	3630 RPM
GB-53 Gear Unit	
Max. Output Shaft Torque:	54,000 LB. IN.
Max. Pinion Shaft Torque:	679 LB. IN.
Ratio:	53 :1
Differential Speed:	57 RPM
Bowl Dimensions:	Same as Above
Package Weight Empty: (Approx.)	8,000 LBS.

THE 5500 HIGH "G" CENTRIFUGE EQUIPPED WITH VISCOTHERM ROTODIFF HYDRAULIC CONVEYOR DRIVE

The standard drive configuration for a 5500 High "G" Centrifuge uses a planetary gearbox to drive the screw conveyor. An alternative drive arrangement is available as an option. The "Viscotherm" Rotodiff Hydrostatic Slip Drive Unit may be used in place of the planetary gearbox. The unit consists of a hydraulic pump and the Rotodiff drive device.

The gearbox is protected from overloading by a torque limit device which uses a preset spring loaded linkage to trip a microswitch and shut down the centrifuge and the feed pump in the event of an over-torque condition.

If the Rotodiff unit is installed, then disregard any reference in this manual to the gearbox or the torque overload device.

The Rotodiff and pump unit are warranted by the manufacturer, "VISCOTHERM AG and an instruction manual for each unit is included with the HH 5500 Service Manual.

CAUTION

It is very important that the Rotodiff Start-Up/Operation Instructions listed in the Instructions Manual be read and understood by operating personnel before any attempt to run the centrifuge is made.

SECTION 2

START-UP

SAFETY

Because the 5500 High "G" Centrifuge is a high-speed, high-torque piece of rotating machinery, ***caution*** should be exercised by operating personnel.

HH recommends operating personnel review the centrifuge manual ***before*** working with the equipment.

Periodic safety meetings to familiarize new operating personnel with the centrifuges characteristics are also recommended.

This manual is intended for use by ***qualified operators*** familiar with processing equipment and trained for this particular centrifuge.

Maintenance personnel should be experienced mechanics.

Electricians should be licensed, qualified personnel familiar with electrical safety procedures.

CAUTION

Persons without recommended experience may not understand the instructions listed in this manual

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A. GENERAL

1. Read all manuals and instructions before attempting to install or operate equipment, and follow all recommendations.
2. Follow all lubricating and/or greasing procedures and schedules recommended in the equipment instructions.
3. If nameplates are lost, damaged, or removed, replace them. They have been affixed to the equipment to provide warnings, instructions, etc., for the maintenance and operating personnel.
4. Do not operate belt driven or chain driven equipment without guards. If equipment was purchased without guards, user is responsible for providing proper guards that meet all applicable codes.
5. Make periodic checks for loose bolts on rotating assemblies, the supporting structure, covers, hatches, guards, and piping connections.
6. Do not operate equipment if excessive vibration or abnormal noise develops.
7. If the equipment is supplied with covers or guards, do not remove these until the equipment has come to a complete stop.
8. Never operate equipment with parts that have not been manufactured or approved by the original equipment manufacturer.

B. HANDLING

1. Safe practices for lifting and handling equipment should be followed. Hoists and slings should be of adequate capacity, inspected regularly, and in good repair.

2. Always use extra caution when lifting, moving, or holding worn parts, since these may be sharp, slippery, or weakened. Never place hands, feet or head at possible pinch points.
3. Always provide a sufficiently large cleared area around the equipment during maintenance.

C. ROTATING EQUIPMENT

1. Do not exceed the maximum speed, process material specific gravity, process pressure or temperature, or maximum design feed rate as specified on the equipment nameplate or within the operating manual.
2. Do not use a pipe wrench on any part of the rotating equipment.
3. Do not interchange parts that have been balanced as an assembly.
4. Do not attempt to utilize the rotating equipment in an application for which it was not originally selected.
5. When taking samples or removing any material from equipment like grinders, screw conveyors, open throat pumps, etc., make sure all machine components are at rest and the power is shut off with the disconnect switch locked in the off position.
6. Do not get rags, loose clothing, sticks, etc., near rotating or moving parts.
7. The equipment must coast to a complete stop. Do not brake it by hand or in any other way force it to stop, unless it is equipped with a braking mechanism supplied by the original equipment manufacturer.
8. Do not operate the rotating equipment unless the direction of the rotating part or assembly conforms to that of the Instruction and/or Operation Manual.
9. If a rotating assembly must be turned by hand, use caution: Avoid sharp edges and close areas where fingers may be cut or trapped (example: pulleys).

D. PUMP

1. If positive displacement pumps are used in the process be sure the discharge line is unobstructed before starting the pump.
2. In plants using any type of grinder with the discharge directly connected to a pump, be sure that the pump is in operation before putting any product into the grinder.
3. Do not run a positive displacement pump dry.

E. EXPLOSION PROOF EQUIPMENT

1. Do not operate equipment driven by an explosion-proof motor and control until all seal fittings are properly sealed with recommended fiber or compound, and tagged.
2. Never use abrasive material or a file to remove corrosion from explosion-proof equipment.
3. Cover screws and bolts used to hold explosion-proof joints together must always be tight, and only of the type and material recommended by the manufacturer.

F. MOTOR

1. Do not neglect to check that the line voltage applied to the motor controller is the same voltage for which the motor is wired.
2. Always follow motor manufacturer's specifications on bearing lubrication.
3. Do not attempt to operate a motor that is overheated due to frequent starts and stops. Allow the motor to cool to ambient temperature (as designated on the motor nameplate) before each restart.

G. ELECTRICAL (General)

1. Install and ground all equipment (permanent and portable) in accordance with requirements of the National Electric Code and local electric codes.
2. Use circuit breakers or fused disconnects between equipment and power source.
3. Never touch electrical components with wet hands or when standing on a wet surface. Insulate yourself from ground and use insulated tools.
4. When handling electrical equipment, take care to avoid contacting live parts. Assume all circuits are live. Check with a voltmeter.
5. Label all control circuits clearly.
6. Keep electrical controls and motors clean and free of dust – dust prevents thorough air circulation, generating heat; heat in turn can ignite the dust or flammable vapors if present in the atmosphere.
7. Never wash electrical equipment unless it is constructed for that purpose. Never wash live electrical equipment.

H. ELECTRICAL (Repairs)

1. Only qualified personnel, familiar with electrical safety procedures and the construction and operation of the equipment, should work on electrical equipment.
2. De-energize all power before opening any electrical enclosure, or before connecting and disconnecting test equipment and components. Provide a safety lockout at the power source.
3. Use only approved safety rubber gloves and mats, insulated tools, and eye shields when doing electrical work.
4. Periodically inspect and operate all of the automatic shut-off devices and monitoring systems provided.
5. On DC powered equipment, do not perform any inspection (mechanical or electrical) until the power has been turned off and disconnected, and all rotating assemblies have come to a complete stop. The moving motor may generate DC voltage feed back.

I. CHEMICALS

1. If corrosive and/or toxic chemicals or solvents are used as part of the process or as cleaning materials: become thoroughly familiar with the properties of the products and their hazards, the precautions necessary to handle the product

safely, and follow all manufacturer recommendations for the type of product being handled.

a. Use in well ventilated area and keep employee exposure below permissible limits.
b. If flammable, take care to prevent fire or explosion.
c. Avoid contact with the skin and eyes – wear goggles, gloves, shields, etc., as required by the nature of the solvent or chemical.

2. If in doubt whether a product is dangerous or not – Assume It Is. Take all necessary precautions to avoid personal injury.

J. VENTILATION

1. Toxic fumes, if present in the system, must not be permitted to escape to the operating area. They should be adequately vented away form the worker in accordance with applicable environmental regulations.
2. If in doubt whether any vapor is toxic or not – Assume It Is. Take all necessary precautions to avoid personal injury or adverse health effects. Worker exposure should be maintained below the permissible limit and at the lowest feasible level.
3. If it is necessary to enter an area where toxic vapors are present, consult with responsible authorities for recommendations concerning safety.
4. Use NIOSH approved breathing apparatus when working with toxic or hazardous materials, or with materials that reduce the oxygen concentration in the air, such as carbon dioxide.

K. COMBUSTIBLE PRODUCTS

1. If combustible products are used as part of the process or as cleaning products, become thoroughly familiar with the safety precautions necessary to handle the product. Follow all recommendations to avoid personal injury or property damage that could be caused by fire or explosion.

L. PRESSURE VESSELS

1. Vessels operating under internal pressure should be maintained and inspected in accordance with the manufacturer instructions and/or applicable local or state codes. If corrosion or erosion is expected, frequency of inspection should be increased. Qualified personnel should make all necessary repairs.
2. Vessels operating under internal pressure should be provided with a safety device to relieve excess pressure in accordance with the Unfired Pressure Vessels Code.
3. Safety devices should be in good operating condition at all times. It is recommended that they be inspected and tested frequently and maintained in accordance with manufacturer instructions and/or applicable local and state codes.

4. If any repair on a safety device is necessary, return it to the manufacturer. Inexperienced personnel should never attempt repair. Any adjustment should be made according to the recommendations supplied by the manufacturer.
5. The outlet connections of all safety devices should be installed in a manner that will not cause injury to personnel should discharge or actuation occur.
6. Before attempting maintenance on pressurized equipment, reduce internal pressure to atmospheric pressure.

M. HOT / COLD PRODUCTS

1. When working with very hot or very cold processes or products, extreme caution should be used to avoid personal injury.

N. LEAKAGE AND SPILLAGE

1. Any leakage in the system should be quickly corrected.
2. Any type of spillage (oil, water, etc.) should be quickly cleaned off floors, walls, equipment, lines, etc., and the entire operating area kept clean.

O. DANGEROUS MATERIAL APPLICATIONS

HH makes both standard equipment and equipment furnished with certain explosion-proof accessories (motor, controls, etc.), as specified by the purchaser. Standard equipment not furnished with explosion-proof accessories must never be used with explosive, chemically unstable, or flammable materials of any kind. Severe personal injury or property damage could result. When we supply equipment furnished with explosion-proof accessories, whether we are the manufacturer or not, we warrant that the particular accessories we describe as explosion-proof comply with accepted industry standards for that term. However, this does not mean, and we cannot and do not guarantee, that one of our machines furnished with explosion-proof accessories is safe for use with explosive, chemically unstable, or flammable materials under ALL conditions.

In some instances, it may be necessary for the user to equip the machine with safety devices not ordinarily placed on equipment of this type. In other cases, the application may be so hazardous that the only prudent operating procedure is to isolate the equipment in an expendable building and operate it by remote control from a safe distance. Because HH has no control over these potential dangerous operating conditions, we do not guarantee that equipment made by us can be safely used with explosive, chemically unstable, or flammable materials, regardless of whether we installed industry accepted explosion-proof accessories. The user has the responsibility for insuring that all precautions required by his particular method of operation have been taken.

P. REPAIRS

1. Do not make mechanical or electrical repairs or attempt disassembly unless the equipment has come to a complete stop, the power is shut off, and a safety lockout or other padlock is installed on the disconnected circuit. The locking device should be tagged to identify the working party.

2. Do not make any repairs until dangerous vapors and gases are replaced with clean air.
3. HH should be consulted before attempting to make major repairs to any of the rotating equipment we manufacture. Under no circumstances should weld repair or other alterations be made to major rotating components without the full knowledge and assistance of qualified Manufacturer personnel. Failure to obtain this assistance may result in rupture of parts involved with possible injury to personnel or damage to equipment.
4. Repairs to hard-surfaced parts must be performed with strict quality control of materials and methods. Hard-surfacing materials are brittle, and can break off if improperly applied. After startup, periodic inspection of these parts is necessary to anticipate separation of materials.
5. During repairs, when equipment may be physically or electronically unstable, post barriers or signs announcing hazardous conditions.
6. After repairs and before restarting, reinstall all guards and reconnect all mechanical and electrical safety devices.

Q. CORROSION, EROSION, AND PITTING OF ROTATING EQUIPMENT

1. To insure a high factor of safety under severe operating conditions, high speed rotating equipment manufactured by HH is designed after a careful stress analysis has been made of highly stressed parts. A thorough control of metallurgical properties is maintained throughout manufacture, and all material is warranted as free of defects at time of shipment.
2. It should be noted that equipment subjected to severe erosive or corrosive environment could deteriorate over a period of time, depending on the severity of the exposure and/or possible misuse. Users of high speed rotating equipment should be aware of the fact that extremely high forces are brought into play when their equipment is in operation. Any weakening of highly stressed members by misuse, erosion, corrosion, chemical pitting, or stress cracking must be guarded against to prevent possible metal failure.
3. In the interest of longer and safer operation of the equipment, HH recommends that the equipment owner maintain a periodic (at least monthly) inspection on highly stressed rotating and/or moving parts which are subjected to erosive or corrosive wear.
4. The following points should be noted and the recommended action taken:

    a. Do not operate equipment when:

    1. Holes are wearing through rotating and/or moving parts.
    2. Grooves greater than 1/16” deep are worn in rotating and/or moving parts.
    3. Evidence of cracks is present, especially in rotating and/or moving parts.
    4. Chemical pitting of 1/16” depth or greater on rotating and/or moving parts.
    5. Component surfaces are covered with a light corrosion or etching.

    b. Chemical pitting is observed:

All cases of chemical pitting, even less than 1/16” depth, should be watched carefully. This pitting action is almost always due to the breakdown of the passive film on stainless surfaces in the presence of chlorides. This often occurs under product cake that has not been sufficiently cleaned from the surface. High temperature, low pH, and high acidity accelerate the pitting action.

5. Contact HH regarding the repair or replacement of rotating and/or moving parts whose surface is noticeably pitted.

INSTALLATION

Location

a. Install the centrifuge unit in a location where sufficient headroom is allowed for lifting the bowl out of its' frame enclosure.
b. A 2-ton overhead hoist should be installed to facilitate inspection or repair work.
c. A clear area in the vicinity of the centrifuge should be provided to set the bowl during inspection or repair.
d. Room should be allowed at the ***front end*** of the machine for withdrawing the planetary gearbox. A zone approximately 2'0" wide x 2' 6" long from the front end of the gearbox should be kept clear.
e. Room should be allowed at the ***rear end*** of the machine for withdrawing the feed tube. A zone approximately 6" wide x 3' 0" long from the end of the feed tube support clamp should be kept clear.
f. Clear access space should be provided around the centrifuge.
g. The centrifuge isolators should set on a smooth level surface on structural members of sufficient strength.

IMPORTANT CAUTION

Since this centrifuge operates at high speed and is subjected to severe wear conditions, it is important that any indications of weakening of highly stressed components be recognized before a failure can occur.

To facilitate this HH recommends a ***monthly*** visual inspection on highly stressed components, such as:
The bowl
Shafts wear plates
Wear tiles
Conveyor, etc.

If inspection reveals:
1. Holes worn through moving parts
2. Wear grooves greater than 1/16" thick in moving parts
3. Cracks present is moving parts
4. Chemical pitting to a depth of 1/16" or greater in moving parts

DO NOT OPERATE THE EQUIPMENT UNTIL REPAIRS ARE MADE

FAILURE TO FOLLOW THE ABOVE RECOMMENDATIONS MAY RESULT IN SEVERE PERSONAL INJURY OR PROPERTY DAMAGE

PIPING

1. Customer piping tie-ins to the centrifuge should be made with flexible connections.

2. Customer tie-in at feed tube should have a suitable pipe support so that no weight is imposed on the centrifuge feed tube.

   A flexible connection is required here.

3. A flush line should be provided at the feed tube tie-in. HH recommends hot water.

   A ball valve should be located as close as possible to the feed line to prevent plugging the flush branch with solids.

4. Use a screen at the pump suction to protect the pump and centrifuge from oversize solids.

5. Liquid discharge lines should have a minimum of ¼ " per ft. slope.

6. HH recommends installation of a pressure indicator in the feed line upstream of the customer tie-in to regulate the feed supply to the centrifuge.

For HH 5500 centrifuges with **Hydraulic Main Drive or Hydraulic Back Drive**, the following hydraulic oil is recommended: MOBIL DTE 26.

(See the Product Data Sheets on the following pages.)

***Caution**:* Other hydraulic oils should only be used with written confirmation that the oil conforms to the specifications on the MOBIL DTR 26 product.

PRESTART SAFETY PRECAUTIONS

FAILURE TO FOLLOW THE RECOMMENDED SAFETY PRECAUTIONS LISTED BELOW MAY RESULT IN SEVERE PERSONAL INJURY OR PROPERTY DAMAGE

Read through this entire list before attempting start-up

Initial Installation

1. The correct bowl rotation must be verified. The bowl should rotate clockwise when viewed from the motor end (rear of centrifuge) looking inboard. The Hydraulic back drive motor should rotate clockwise looking from the top.

2. Insure that the cooling water and return line to the hydraulic back drive heat exchanger are connected, and the appropriate flow rate is set

3. The drive group enclosure guard and the gearbox shroud must be secured in place.

4. Check to see that the centrifuge unit is clear of rags, ropes, wires, or any other material which could catch or snag rotating parts.

5. All bolts and capscrews must be engaged per recommended torque requirements shown in Charts 1 and 2 at the end of this section.

6. All rings and seals should be in good condition and securely fastened.

7. The centrifuge cover should be tightly secured.

8. The frame bolts should be fully tightened.

9. Check all lubrication points. (See Lubrication Section)

10. Verify that all seal fittings at explosion-proof motor and control are sealed with CHICO X Fiber and sealing compound.

11. The drive belt should be checked for correct tension. *Caution:* Over tightening belts can damage the fluid coupling. (See Figure 1 at the end of this list.)

12. Electrical grounding straps must be secured in place, where required.

13. Maximum Speed, specific gravity, or pressure, indicated on the centrifuge name plate is not to be exceeded.

14. No work is to be performed on the electrical system unless the power is shut-off.

15. Check the line voltage on initial start-up to ascertain that the voltage applied to the motor controller is the same voltage that the motor is wired for.

16. If excessive vibration is present during start-up, shut the unit down immediately and notify HH service representative.

17. Do not replace any damaged or worn out ***Machine Parts*** with other than HH replacements.

18. The customer may replace ordinary wear parts such as oil seals, o-ring and gaskets. A replacement list is in the Parts List Section.

19. Do not open the cover or attempt removal of a shroud or belt guard until the centrifuge is motionless.

20. Use the correct tools for any assembly or disassembly work.

21. Do not supply slurry into the centrifuge until the unit is fully up to normal operating speed.

22. If more than one (1) centrifuge is in operation, never attempt to exchange any machined parts.

23. Never use a pipe wrench on any part of the centrifuge.

24. There is a slow down period as the machine decelerates towards shut-down. Leave the cover shut until the centrifuge is motionless. Do not attempt any disassembly before the machine is static.

25. Never prop the centrifuge cover partially open by using blocks of wood or any other foreign object.

IMPORTANT CAUTION

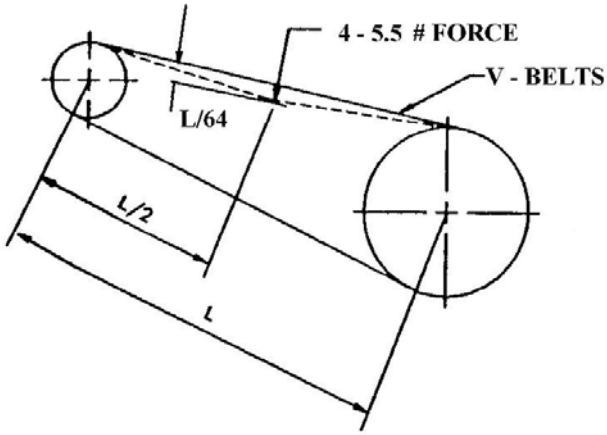
26. Whenever the centrifuge cover is opened for cleaning, inspection, etc., the one (1) hinge safety pins must be engaged to prevent accidental closing of the cover, this procedure should ***always*** be followed.

27. Flexible connections should be used at all customer piping tie-ins.

28. Do not attempt any repairs to the Rotodiff at the front of the machine beyond replacement of the oil.

5500 HIGH "G" CENTRIFUGE
BELT TENSIONING PROCEDURE

FIGURE 1.



Remove Belt Guard

Measure Distance "L" in inches.
Divide by 64.
Force required to deflect belt = 4 to 5.5 Lbs.

Caution:
Do not over-tighten belts

5500 60/60
START UP AND SHUT DOWN PROCEUDRE

Start up

1. Do a visual inspection of the unit checking for any loose wire leads or electrical connections, check that all guards are in place and securely fastened. Insure the case lid is fastened securely and there are no missing or loose clamps.
2. The control panel door should be closed and secured.
3. Check for any oil leaks from the back drive unit at the pump and at the drive unit on the centrifuge.
4. Check the oil level sight glass on the back drive pump unit making sure the level is correct.
5. Check for any oil leaks at the main drive fluid coupling.
6. If any leaks are found anywhere they should be addressed and corrected immediately.
7. Insure that the feed tube and feed hose from the pump are secured.
8. Insure that any valves from the feed pump and to the feed tube are in the open position (open any valve or suction side).
9. Turn the cooling water on for the back drive pump unit.
10. Check for any leaks at the heat exchanger or the hose supplying the cooling water. Make sure there are no kinks in the cooling water supply hose. Any leaks or restrictions in the cooling water supply line could cause a shut down from over temperature of the hydraulic oil.
11. Turn main power on, the alarm lights and the horn should turn on. Push the horn silence button. Check and record any alarm lights that are not on and replace the bulb immediately. Push the reset button to reset the alarms. Any alarms that do not reset need to be addressed and corrected before going to number 12.
12. Push the start button for the back drive unit, monitor the bar pressure on the manometer. With no product the bar pressure should be less than 10 bar.
13. Check the flow for the differential speed on the flow meter sight glass.
14. Adjust the differential speed if necessary by turning the differential set point knob.
15. Push the start button for the main drive and wait until reaching full speed.
16. Check bar pressure on manometer it should be below 25 bar.
17. Be sure feed rate on the feed pump is not higher than 25gpm before starting it.
18. Start feed pump.
19. Monitor bar pressure on manometer periodically.

Shut down

1. Lower feed rate on the feed pump to 25gpm.
2. Turn feed pump off.
3. Turn flush water on and let the centrifuge run for 5 minutes to clear any product still in the bowl.
4. Check bar pressure on the manometer it should be below 10 bar.
5. Push the stop button for the main drive and let it come to a complete stop before turning flush water off.
6. After main drive is at a complete stop push the stop button for the back drive.
7. Turn the cooling water off for the back drive pump.
8. Turn main power off.

SECTION 3

OPERATION

OPERATION

The slurry to be separated is pumped into the feed tube, axially located at the rear of the machine.

The slurry is directed into a feed chamber where it is dispersed by four (4) externally mounted feed nozzles and directed by centrifugal force along and against the inside wall of the bowl.

This ring of slurry or “pond” will contain solids against the bowl wall. These solids are scrolled forward over a “beach area” by the screw conveyor and discharged through four (4) ports at the solids end of the centrifuge located in the rear.

The lighter liquids migrate forward and are discharged through four (4) adjustable plate dam nozzles at the liquids discharge area located at the front end of the centrifuge; i.e. the gearbox end.

Over torque and resetting
Hydraulic Back Drive

The hydraulic back drive unit has (2) electrical safety switches, the red flag and green flag, for protecting the Rotodiff from over torque damage. Along with the electrical switches the pump unit has a mechanical bypass valve for oil flow diverting when a preset high pressure is reached. This preset pressure level cannot be altered. The pump unit also has a visual pressure manometer so that the operator can monitor pressure at all times.

The green flag and red flag pressure levels can be changed to accommodate the process in which the centrifuge will be operating.

The green flag is first in the pressure safety settings. It is set so that if the centrifuge begins to reach a higher than normal pressure level the green flag will turn the feed pump off, providing the installation of the feed pump has it wired into the control panel on the centrifuge.

If a green flag occurs there will be an audible horn and the red light on the control panel will illuminate.

1. Once the feed pump is off the pressure should come back down to the normal operating levels.
2. The horn silence button should be pressed this will silence the horn only and not reset any lights or alarms.
3. If the pressure comes back to normal operating levels then the unit may be reset.
4. The reset button on the control panel then must be pressed.
5. The feed pump must be restarted from the control panel.

The red flag is next in the pressure safety settings. It is set so that if the pressure continues to rise after the feed pump is off it will shut the centrifuge off leaving the back drive running. As the G-force goes down the back drive will continue to run to try to clear the material in the centrifuge.

The centrifuge may begin to bypass through the bypass valve, if this happens the centrifuge and the hydraulic pump must be turned off. Then the hydraulic unit must be jogged on and off until the plug has cleared.

Note: The hydraulic unit must not be started more than once every 30 seconds with a maximum of 5 minutes. Then the unit must set idle in the off state for 30 minutes before the cycle can start again.

If this procedure does not clear a plugged centrifuge, HH must be contacted for further instruction.

PLATE DAMS ADJUSTMENT

1. The four (4) plate dams are used to set the "Pond" depth.

2. The plate dams are located in the front hub. Access to the plate dams is allowed by raising the centrifuge cover with the machine shut down.

3. The plate dams are adjusted by loosening three (3) capscrews and rotating the plate clockwise.

4. A Maximum Setting, (i.e., the highest number engraved on the plate aligned with the arrow mark on the front hub) will cause ***a maximum pond depth*** giving maximum clarification of the liquid.

5. A Minimum Setting (i.e., the lowest number engraved on the plate aligned with the arrow mark on the front hub) will cause ***a minimum pond depth*** and will result in the ***Maximum dryness of the discharged solids.***

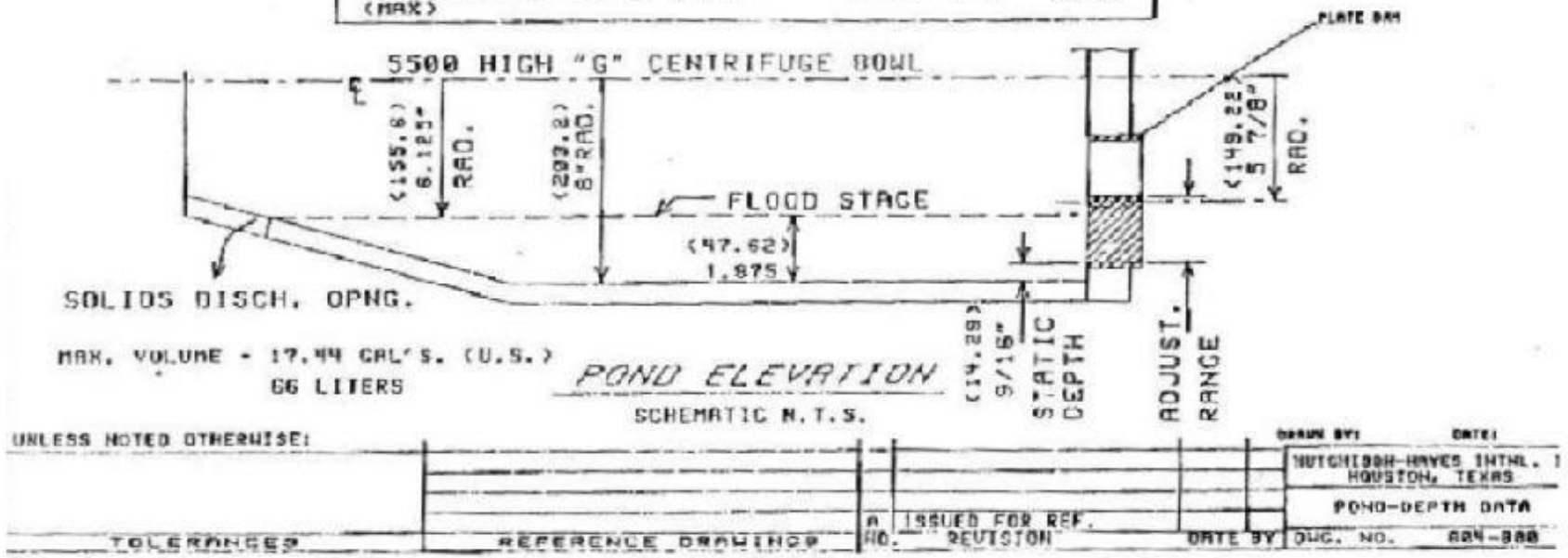
IMPORTANT

6. When plate dams are indexed by rotation, all four (4) dams must be indexed to the same number.

7. After adjusting, always recheck all twelve (12) capscrews for correct tightness.

PLATE DAM SETTING	POND DEPTH (IN)	POND DEPTH (MM)	VOLUME (GAL.)	VOLUME (LITERS)
1 (MIN.)	9/16"	14.29	5.27	19.95
2	5/8"	15.88	5.85	22.14
3	11/16"	17.46	6.44	24.38
4	13/16"	20.64	7.6	28.77
5	15/16"	23.81	8.77	33.2
6	1 1/8"	28.58	10.51	39.8
7	1 5/16"	33.34	12.25	46.37
8	1 1/2"	38.10	13.98	52.92
9	1 5/8"	41.28	15.12	57.24
10	1 3/4"	44.45	16.27	61.59
11 (MAX)	1 7/8"	47.63	17.4	65.87

NOTE:
DISREGARD SETTINGS 12 AND 1
THEY ARE BEYOND WORKING
POOL DEPTH RANGE.



UNLESS NOTED OTHERWISE:

TOLERANCES

REFERENCE DRAWINGS

NO.	REVISION	DATE	BY
A	ISSUED FOR REF.		

DRAWN BY: DATE:

HUTCHISON-HAYES INTNL.
HOUSTON, TEXAS

POND-DEPTH DATA

DWG. NO. 884-888

SECTION 4

LUBRICATION

MOBIL PRODUCT DATA SHEET
MOBIL DTE® 20 Series
Super-Stabilized, Antiwear Hydraulic Oils

Description

Mobil DTE 20 Series high-quality hydraulic oils were developed in cooperation with pump and component manufacturers specifically for severe hydraulic systems using high-pressure, high-output pumps. These oils provide the superior antiwear and film strength characteristics necessary for critical systems. They are formulated from stable, high-quality, high-VI base stocks and additives which provide the specific properties required in hydraulic fluids. Mobil DTE 20 Series provide outstanding performance in all standard industry tests, and are approved in the Denison HFO, Vickers V-104C and 35VQ25, and Sundstrand pump tests. Their 12 stage rating in the FZG Gear Test demonstrates a high level of protection against wear and scuffing. Mobil DTE 24, 25, and 26 are qualified against Cincinnati Milcron specifications P-68, P-70, and P-69 respectively.

The super-stabilized additive system of the Mobil DTE 20 Series was selected to neutralize the formation of corrosive materials, provide excellent anti-wear properties, and multimetal compatibility. This additive system also provides better thin oil film protection against rusting, retention of superior oil cleanliness, and improved compatibility with water**.**

Typical Characteristics

Physical characteristics are listed in the table. Values not shown as maximum or minimum are typical and may vary slightly.

Applications

Mobil DTE 20 Series oils are Mobil's primary recommendation for most hydraulic applications in industrial, marine and Mobil service, including high-pressure systems, with servo valves and all robotics.

Advantages

Mobil DTE 20 Series oils offer the following performance benefits:

- Excellent keep-clean performance for systems critical to deposit buildup, such as sophisticated NC control mechanisms
- Controlled demulsibility allows the oils to work well when contaminated with small amounts of water, and to separate large amounts of water readily
- Multimetal compatibility under both wet and dry conditions protects pumps using steel and copper alloys
- Excellent protection against rust; good thin oil film protection for surfaces intermittently wetted by oil

- **Outstanding load-carrying and antiwear properties provide superior protection against wear**

Health & Safety

Based on available toxicological information, these products produce no adverse effects on health when properly handled and used. No special precautions are suggested and beyond attention to good personal hygiene, including laundering oil-soaked clothing and washing skin-contact areas with soap and water. To obtain Material Safety Data Bulletins, to request additional technical information, or to identify the nearest U.S. Mobil supply source, call 1-800-662-4525.

	Mobil DTE 22	**Mobil DTE 24**	**Mobil DTE 25**	**Mobil DTE 26**
Product Number	60260-7	60262-3	60263-1	60264-9
Gravity API	32.6	30.4	28.4	27.5
Specific Gravity	0.862			0.89
Pour Point °C (°F), max.	-23 (-10)	-23 (-10)	-23 (-10)	-23 (-10)
Flash Point °C (°F), min.	202 (395)	202 (395)	202 (395)	204 (400)
Viscosity,				
eSt at 40° C	22	32	46	68
eSt at 100° C	4.5	5.3	6.7	8.5
SUS at 100° F	11.5	165	238	3.35
SUS at 210° F	41	44	49	55
ISO Viscosity Grade	22	32	46	68
Viscosity Index	95	95	95	95
Rust Protection ASTM 665	..…Pass.….			
Color, ASTMD 1500, max.	2	3.5	4	4

Mobil Oil Corporation
TECHNICAL PUBLICATIONS
3225 Gallows Road, Fairfax, Virginia 22037-0001

Due to continual product research and development, the information contained herein is subject to changes without notification
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Mobil DTE 20 Series
PDS I-04 6095001 (01-09-95)

RECOMMENDED LUBRICATING GREASE FOR THE 5500 CENTRIFUGE

CHEVRON SRI-2 or MOBIL SHC 220

Lubrication fittings are located at the pillow block housing (front and rear) and on the front and rear hub shafts for conveyor bearing lubrication.

NOTE: The conveyor bearing grease fittings are located inside the machine frame, and the cover must be opened to gain access to the grease fittings.

NOTE: Pillow block and conveyor bearings are shipped from our manufacturing plant with the proper amount of grease.

Royal Purple

NEW IMPROVED

SYNERGY ™
HIGH PERFORMANCE GEAR OIL

SYNERGY is an ultra-tough, multi-service gear oil designed to smoothly lubricate all types of gears under all conditions. Synergy outperforms other E.P gear oils because it contains Synslide ™, our proprietary synthetic oil film so tough and tenacious it is not squeezed out of the pressure area. It virtually eliminates both gear and bearing wear – even under severe "squeeze film" conditions caused by extremely high loads, sudden shock loads, or low Rpm's. Slippery synthetic molecules increase the lubricity and oiliness of SYNERGY. Gears run smoother, quieter, cooler and longer without overhauls. SYNERGY is non-corrosive to both ferrous and non-ferrous metals. Its ability to separate rapidly and completely from water prevents sludge and wear found in wet gear boxes (such as cooling tower gear boxes). SYNERGY employs a unique, dense, high molecular weight synthetic cushioning additive to prevent fatigue failure in gears subjected to sudden loads.

SYNERGY'S exclusive performance advantages:

- Severe Service – performs under loads where other E.P. gear oils fail
- Lower Coefficient of Friction – saves energy and reduces temperatures
- High Temperature Performance – eliminates harmful deposits – extends oil drains
- Cushioning Molecules – reduces fatigue failures in bearings and gears
- Environmentally Safe – non-toxic as all components are on TSCA's approved list and fully comply with all OSHA and EPA guidelines
- Synslide ™ - proprietary, slippery, tenacious, ultra-tough synthetic film
- Prevents Corrosion – protects both ferrous and non-ferrous metals during operation and shut-down
- Water Separation – complete separation of oil and water to prevent emulsion
- Compatibility – 100% compatible with both mineral and synthetic gear oils

Customer Benefits:

- Saves Money – Saves energy, extends gear box life and reduces down-time
- Multi-Applications – one oil for all gears – spur, helial, herringbone, worm, etc.
- Multi-Conditions – for all speeds, all horsepower, all loads and all temperatures
- Superior Lubrication – smoother, quieter, cooler, more efficient gear boxes

Recommended For:

- All Gear Boxes – regardless of type, horsepower, speed, load or temperature
- All Metals – non-corrosive to both ferrous and non-ferrous metals
- All Service – shock load, high pressure, high and low temperature
- All Users – ready for a quantum leap in gear box performance

SYNFILM® GT

Multi-Purpose Industrial Oil

ROYAL PURPLE

Beyond Synthetic™

Beyond Synthetic™

Synfilm® GT is recommended for use in gas and steam turbines, pumps, bearings, gears, air tools, etc. Synfilm® GT should be considered instead of Synfilm® when oil reservoir temperatures exceed 200°F, improved low temperature fluidity is desired or when a viscosity grade is not available in Synfilm®.

Synfilm® GT is a long life, high film strength, energy efficient, synthetic lubricant that significantly increases bearing life and equipment reliability. Synfilm® GT gains its performance advantages over competing mineral and synthetic oils through its superior blend of synthetic base oils plus Royal Purple's proprietary Synerlec® additive technology. This unique additive technology is proven to make equipment run smoother, cooler, quieter, longer and more efficiently.

Synfilm® GT typically replaces conventional, low film strength, R&O (rust and oxidation inhibited) oils that rely solely on their viscosity to protect equipment against wear.

Synerlec® additive technology makes the difference!

Synthetic oils enable Royal Purple to make superior lubricants, but it is Royal Purple's advanced Synerlec® additive technology that gives Royal Purple's lubricants their amazing performance advantages. Synerlec® additive technology truly is *beyond synthetic.™*

Synerlec® additive technology forms a tough, slippery, synthetic film on all metal surfaces. This proprietary film significantly improves lubrication: first, by increasing the oil's film thickness, and second, by increasing the oil film's toughness, both of which help to prevent metal-to-metal contact. It displaces moisture from metal surfaces and protects all metals against rust and corrosion. It also fortifies the oil against the detrimental effects of heat, which causes oil to oxidize.

Exclusive Performance Advantages:

- **High Film Strength**
  Synfilm® GT protects bearings far beyond the ability of other turbine oils, carrying up to 700 percent greater loads.
- **Rapidly Separates from Water**
  Synfilm® GT rapidly and completely separates from water, which is easily drained from the bottom of the oil reservoir.
- **Saves Energy**
  Synfilm® GT has an extremely low coefficient of friction that is proven to save energy over conventional oils. In rotating equipment these savings frequently exceed the total cost of the oil within several months, making what was once an oil expense a profit.
- **Extremely Clean**
  Synfilm® GT is packaged in new poly containers, has a typical ISO 4406 Cleanliness Level of 14/13/11 (ISO 32, 46 and 68 only) and is verified by a laser particle counter. This is up to 250 times cleaner than other new oils delivered in steel drums or by bulk delivery.
- **Reduces Bearing Vibrations**
  The tough oil film of Synfilm® GT coupled with its ability to micro-polish contacting bearing elements provides superior bearing lubrication.
- **Longer Oil Life**
  Synfilm® GT has outstanding oxidation stability that greatly extends oil change intervals while keeping equipment clean.
- **Excellent Corrosion Protection**
  Synfilm® GT's tough oil film forms an ionic bond on metal surfaces, which acts as a preservative oil during shutdown and provides instant lubrication at startup.
- **Synthetic Solvency**
  Synfilm® GT's natural solvency cleans up dirty equipment and keeps it clean.
- **Compatible with Seals**
  Synfilm® GT has excellent seal compatibility.
- **Compatible with Other Oils**
  Synfilm® GT is can be mixed with other mineral oils and most synthetic oils. (It is not compatible with silicone or glycol synthetics.)
- **Environmentally Responsible**
  Synfilm® GT components are TSCA listed and meet EPA, RCRA and OSHA requirements. Synfilm® GT extends oil drain intervals, eliminates premature oil changes, decreases the amount of oil purchased and disposed of and conserves energy.

Royal Purple, Ltd. • 1 Royal Purple Lane • Porter, Texas 77365
Phone: 281-354-8600 • Fax: 281-354-7600 • www.royalpurple.com

PS0003 09/01

	ISO Grade / AGMA Grade										
Typical Properties*	10	22	32	46	68	100	150	220	320	460	680
AGMA Grade	—	—	—	1	2	3	4	5	6	7	8
Viscosity											
cSt @ 40°C	10	22	32	46	68	100	150	220	320	460	680
cSt @ 100°C	2.6	4.5	5.8	7.4	9.9	12.6	16.8	21.9	28.2	34.1	45.7
SSU @ 100°F	61	115	165	236	350	518	780	1151	1685	2445	3632
SSU @ 210°F	35	41	46	51	60	70	87	110	139	166	222
Viscosity Index	105	118	126	126	128	120	120	120	119	110	114
Flash °F	375	440	480	520	495	490	490	500	500	500	500
Pour Point °F	-70	-80	-80	-75	-65	-45	-45	-35	-30	-30	-30
ISO Cleanliness Level	**	**	14/13/11	14/13/11	14/13/11	N/A	N/A	N/A	N/A	N/A	N/A
ASTM D-1401 Demulsibility (from 40/40/0/0 to 40/40/0/30)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
D-892 Foam Tests											
Sequence I, II, & III	—	—	—	—	—	—	—	—	—	—	—
D-130 Copper Corrosion											
3 hrs. @ 210°F	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A
250 hrs. @ 210°F	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A	1A
Cincinnati Millicron "A"											
72 hrs. @ 275°F	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
D-665 Rust Test											
Fresh Water	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Salt Water	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
D 2893 Dry Air Oxidation											
312 hrs. @ 203°F											
% Viscosity Increase	0	0	0	0	0	0	0	0	0	0	0
Precip. No. (% Solids)	0	0	0	0	0	0	0	0	0	0	0

*All properties are typical and may vary.
**Check with manufacturer regarding availability with 14/13/11 cleanliness.

afilm® GT's solvency cleans wear metals and deposits left behind by previous oils. These wear metals and deposits can become soluble in the new oil, causing abnormal-alues on used oil analysis until equipment is clean.

Hutchison Hayes 5500 Centrifuge
Lubrication Schedule

	Frequency	Lubricant
Pillow Block Bearings:	24 Hrs Run Time 2 Shots per fitting	Chevron SRI-2 Mobil SHC-220
**Conveyor Bearings:	15 Days Purge till relief	Chevron SRI-2 Mobil SHC-220
Gearbox:	First Oil Change after 500 hrs. of operation, then every 6 months.	Royal Purple Synergy Gear Oil ISO Grade 150 SAE 90 AGMA Grade 4EP
Torque Control Linkage:	6 months	NEVER-SEEZ Compound
Fluid Coupling:	"FORMSPRAG" Model 12.4 HSD	
138 Fl. Oz. Cap. (fill#11) Change oil every 4000 hrs. For fire resistant fluid, every 10,000 hrs. or every two years.	ABOVE 130 DEG. F.	SAE 10W Fyrquel 550 Houghto Safe 1010
	BELOW 130 DEG. F.	SAE 5W Fyrquel 90 Houghto safe 1010 Pydraul 29E LT

(See Vendor Section of this manual
for complete filling instructions)

**** After every washing or steam-cleaning of the conveyor, check the conveyor bearing lubrication.**

SECTION 5

ASSEMBLY AND DISASSEMBLY

HYDRAULIC BACK DRIVE
ROTODIFF REMOVAL

STEPS:

1. **Follow all lock out and tag out safety procedures. Insure power is off.**

2. Remove guard over Rotodiff.

3. Remove low-pressure hose from port block on the rear of Rotodiff. A “T” on the block marks the low-pressure hose. Keep hose elevated to prevent oil from leaking. Cover hose end to prevent foreign debris from entering.

4. Remove the high-pressure hose and follow same procedure as in #3. A “P” on the block marks high-pressure hose.

5. Place a sling (held by the overhead hoist) under the Rotodiff.

6. Remove the six (6) metric adaptor hub screws.

7. Using two (2) of the cap screws just removed, jack the gearbox out of the adaptor hub.

8. With the sling carrying the Rotodiff weight, carefully withdraw the Rotodiff and set it on its side in a clean, clear area.

9. Remove the spline shaft by pulling it straight out of the centrifuge.

10. To reinstall the Rotodiff the spline shaft must be removed from the centrifuge and installed into the Rotodiff first then inserted back into the centrifuge for installation.

Do not attempt to dismantle the Rotodiff. A damaged Rotodiff must be returned to HH for repairs.

ROTATING ASSEMBLY REMOVAL

STEPS:

1. Remove gearbox shroud by removing six (6) capscrews and slowly lifting vertically.

2. Carefully remove the drive group enclosure.

3. Remove drive belt by moving the motor toward towards the centrifuge using the Nema adjust motor base to slacken the belt. (The adjusting bolt is 3/ 4", 1-1/ 8" across the hex flats.)

4. Disconnect the feed-line to centrifuge.

5. Untighten feed tube clamp by loosening four (4) bolts. Do not remove feed tube clamp cover.

6. Remove feed tube. It pulls straight out.

7. Remove the front and rear pillow block dowel pins by jacking them out using the threaded connection at the top of the pins to withdraw them.

8. Remove pillow block bolts.

9. Fully open centrifuge cover and secure one (1) safety latch pins.

10. Using hardened capscrews, attach bowl lift lugs at front and rear of bowl.

11. Using the bowl spreader-bar, attach shackles to lifting lugs and slowly lift the bowl and rotodiff assembly as a unit, if rotodiff has not been removed prior to this step, using the 2-ton overhead hoist.

12. Set the assembly down horizontally in a clean clear area.

CONVEYOR REMOVAL
Positioning bowl for conveyor removal
(After the gearbox has been removed)

1. With bowl assembly now sitting horizontally in a clear, clean work area, remove the bowl spreader bar.

2. Attach the conveyor lifter to the adaptor hub (at gearbox end of centrifuge) using four (4) 7/16 – 14 UNC X 2 3/ 4" long bolt with heavy hex head nuts. The rotodiff should have been removed prior to this procedure.

3. Place the bowl assembly on a support stand as shown in Figure 1.

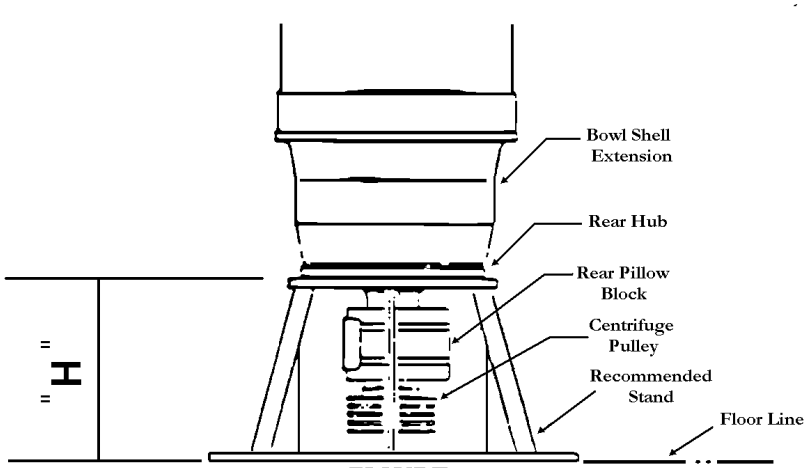


FIGURE 1

4. Height "H" in diagram must be tall enough so the drive sheave (pulley) clears the floor by at least two (2) inches.

CAUTION: Never allow the drive shaft to contact any surface during this lifting procedure. It is not designed to carry any load and can easily be damaged.

5. The weight must be carried through the rear hub resting on the stand.

With the bowl assembly now resting securely in an upright position:

6. Remove the twelve (12) 3/8" / capscrews from the front hub at top end of the bowl assembly.

7. Using four (4) bolts just removed, screw them into the four (4) jackscrew holes and remove the hub.

8. Once the front hub is jacked free, it can be lifted out with the overhead hoist.

9. Set this front hub, pillow block, and gearbox adaptor hub assembly in a clean, clear space.

10. Unbolt the **Conveyor Lifter Plate** from the gearbox adaptor hub just removed.

11. Remove four (4) capscrews from the seal housing at the end of the conveyor and attach the **Conveyor Lifter Plate**.

12. Slowly hoist out the conveyor.

13. Set the conveyor upright on a smooth, clean and clear work area.

14. With the hoist still attached to the conveyor, secure the conveyor assembly with ropes so it cannot topple over.

15. Once secured, disconnect the hoist connection and remove the Conveyor Lifter Plate.

CONVEYOR DISASSEMBLY
FRONT CONVEYOR BEARING REMOVAL

1. If the front conveyor bearings are in good condition, they do not need to be pulled. Disregard Steps 2, 3 and 4 and go to Step 5.

2. If the Front Conveyor Bearings are worn out or damaged, remove the six (6) capscrews from the liquids and seal housing.

3. Jack out the liquids end seal housing using two (2) capscrews just removed.

4. Using a slide hammer type bearing puller, remove the two (2) bearings.

5. Remove the Conveyor Bearing Housing by removing the eight (8) capscrews and jacking it out using two (2) of the removed capscrews.

   This opens the end of the Conveyor Tube and allows access to the Accelerator Plate and Feed Chamber Liner.

ACCELERATOR PLATE AND FEED NOZZLES

1. The accelerator plate is removed by inserting the long T-handle wrench into the conveyor tube and screwing it tightly into the threaded hub on the centerline of the accelerator plate.

2. With the T-handle wrench * attached firmly, loosen the two (2) 3/8'setscrews and the two (2) 3/8' lockscrews from the conveyor tube. They are located just forward from the feed nozzle located on the outside of the conveyor tube.

3. With the setscrews and lockscrews backed-off enough to allow the plate to be pulled out, slowly withdraw the accelerator plate.

4. Remove the four (4) externally mounted feed nozzles by unscrewing two (2) capscrews at each nozzle and withdrawing each nozzle by gripping its' flange and pulling it out.

5. Note the condition of the O-Ring on each feed nozzle.

* T-handle wrench (available from HH)

CONVEYOR REAR BEARING HOUSING REMOVAL

1. Remove the conveyor as per the previous **Conveyor Removal Section**, but set the conveyor in a horizontal position on a clean, clear work surface.

2. Remove the conveyor lifter plate from the front of the conveyor.

3. Carefully raise the conveyor to **a *vertical position*** with the front end (gearbox end) resting on a very clean surface.

4. Remove the rear bearing housing by unscrewing the six (6) 1/ 4" capscrews.

5. Using two (2) of the screws just removed, place them in the two (2) jackscrew locations and evenly jack the solids-end bearing seal housing (Item 11) out.

6. Inspect the two (2) oil seals, and the O-Ring for any damage. If damaged or worn, remove them.

7. Inspect the ball bearing. If it is in good condition, go to Step 10.

8. If the bearing must be replaced due to wear or damage, reinsert the six (6) capscrews in the rear bearing housing to stabilize it for pulling the ball bearing.

9. Use a slide hammer type bearing puller to extract the bearing.

10. Remove the six (6) capscrews from the rear bearing housing and using two (2) of them, jack-out the bearing housing, the retainer tube assembly will come out with the rear bearing housing.

11. Remove the six (6) capscrews from the retainer tube flange.

12. Pull the retainer tube assembly out.

13. Inspect the front oil seals for wear or damage.

    If the front oil seals are worn or damaged, they will have to be replaced.

14. To replace the two (2) front oil seals, the bearing must be pulled.

    Replace the rear bearing housing into the conveyor and replace the six (6) capscrews.

15. Remove the ball bearing using a slide hammer type bearing puller.

16. Remove the oil seal retaining ring.

17. Pull the two (2) oil seals and replace them.

18. Remove the rear bearing housing.

Now access is clear for removal and inspection of the retainer tube seal.

RETAINER TUBE SEAL REMOVAL

1. Reach into the conveyor and remove the four (4) 1/ 4” capscrews on the seal retainer plate.

2. Pull the seal retainer plate out.

3. Inspect the oil seal and replace if worn or damaged.

Part Numbers
Hutchison Hayes 5500 High 'G' Centrifuge
HH Machined Components

Item No.	Description	HH Part
1	Bowl	04065
1A	Bowl Liner	
2	Bowl Extension	04052
3	Conveyor	04053
6	Flinger	04073
9	Rear Hub	04050
10	Conveyor Bearing Housing (Solids End)	04054
11	Conveyor Bearing Seal Housing (Solids End)	04083
12	Retainer Ring	04071
13	Retainer Tube	04010
15	Pillow Block Housing	04058
16	Pillow Block Housing	04058
17	Bearing End Plate	04059
18	Spacer Ring	04081
19	Flinger Cover	04060
19A	Flinger Cover (nearest gearbox)	04072
20	Flinger	04073
21	Case Flinger	04084
22	Feed Tube Assembly	04009/ 13994
24	Accelerator Plate Assembly	04056
27	Feed Nozzle	04057
28	Wear Liner @ Feed Nozzle	04046
29	Solids Discharge Wear Insert	04062
35	Drive Sheave	04061/ 04001
36	Drive Sheave Seal Housing	04087
37	Conveyor Bearing Housing (Liquids End)	04055
38	Splined Adapter	04078
39	Front Hub	04051
40	Seal Housing (Liquids End)	04063
41	Plate Dam	04067
42	Gearbox Adaptor Hub	03062

*** S.T.C. (Sintered Tungsten Carbide**

Seal Retaining Rings
Customer Replaceable Items

Item No.	Description	HH Part
12	Snap Ring Solids Bearing Housing	04036
43	Snap Ring Liquid Seal Housing	04037

Bearings
Customer Replaceable Items

Item No.	Description	HH Part
100	Rear Pillow Blow Bearing	04042
101	Front Pillow Blow Bearing	04043
102	Conveyor Bearings, Rear (Solids End)	04040
103	Conveyor Thrust Bearings, Front (2-Req'd)	04041

Oil Seals
Customer Replaceable Items

Item No.	Description	HH Part
200	Seal for the Rear Seal Housing	04032
201	Seal for the Rear Bearing Housing	04031
202	Sheave Seal	04033
203	Retainer Tube Seal	04030
204	Front Seal Housing Seal	04032

All seals good for 300F

Gaskets
Customer Replaceable Items

Item No.	Description	HH Part
205	Drive Sheave Gasket	04069
207	Dam Plate Gasket	04068

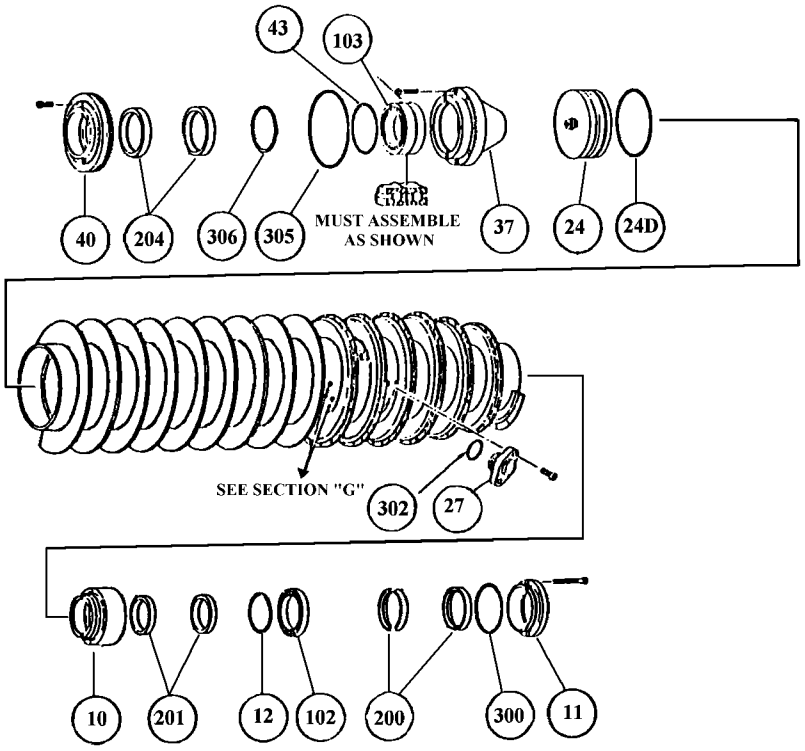
O-Rings
Customer Replaceable Items

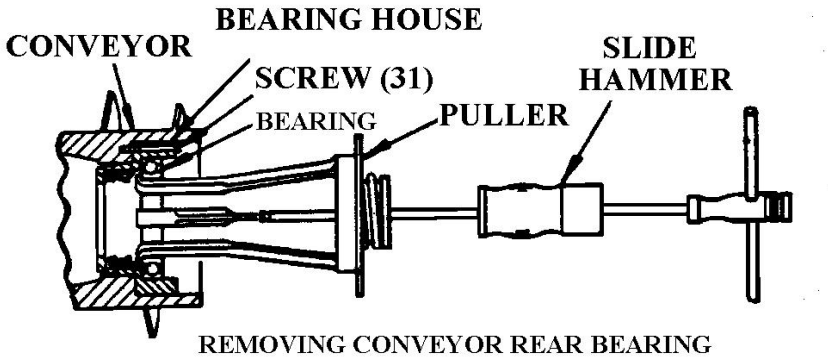
Item No.	Description	HH Part
24d	O-ring accelerator plate	04022
300	O-ring solid end seal housing	04023
304	O-ring Liquid hub & conical section	04025
302	O-ring feed nozzle	04020
305	O-ring liquid end Seal Housing Inner	04024
306	O-ring liquid end seal Housing Inner	04021

Grease Fittings
Customer Replaceable Items

Item No.	Description	HH No.
400	Grease Fitting, Non-Corroding 1/8" PTF Straight Type	03089
401	Grease Pressure Relief Fitting	03088

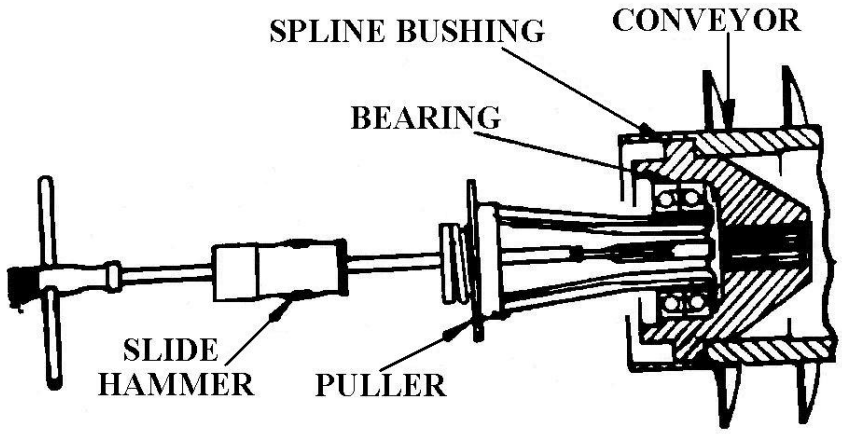
5500 CONVEYOR ASSEMBLY



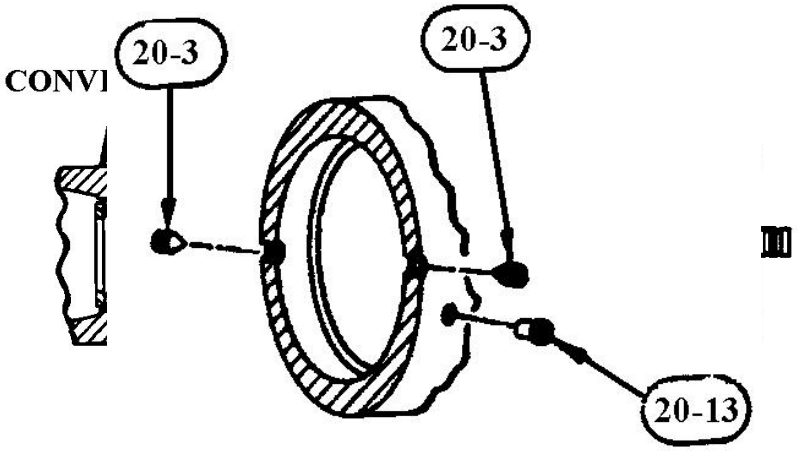


REMOVING CONVEYOR REAR BEARING
VIEW "E"

5500 CONVEYOR ASSEMBLY
(CONTINUED)



REMOVING CONVEYOR FRONT BEARING
VIEW "D"

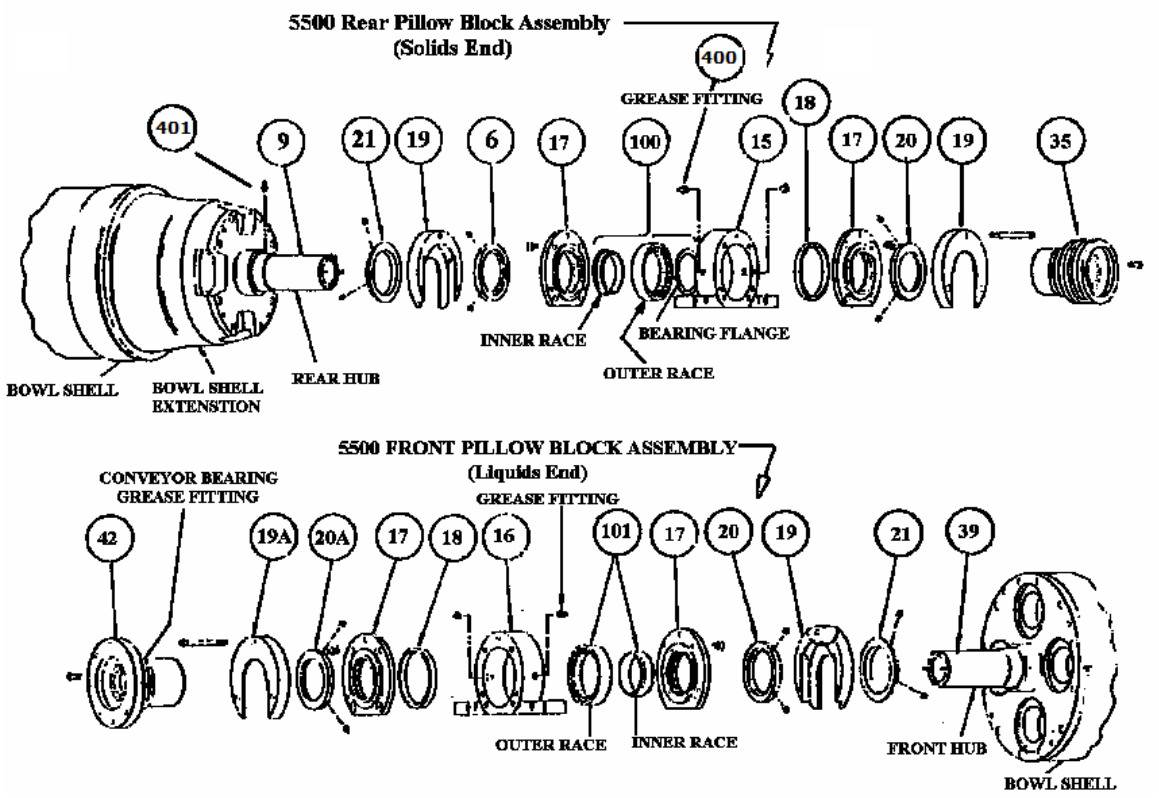


SECTION "C"

PILLOW BLOCK DISASSEMBLY

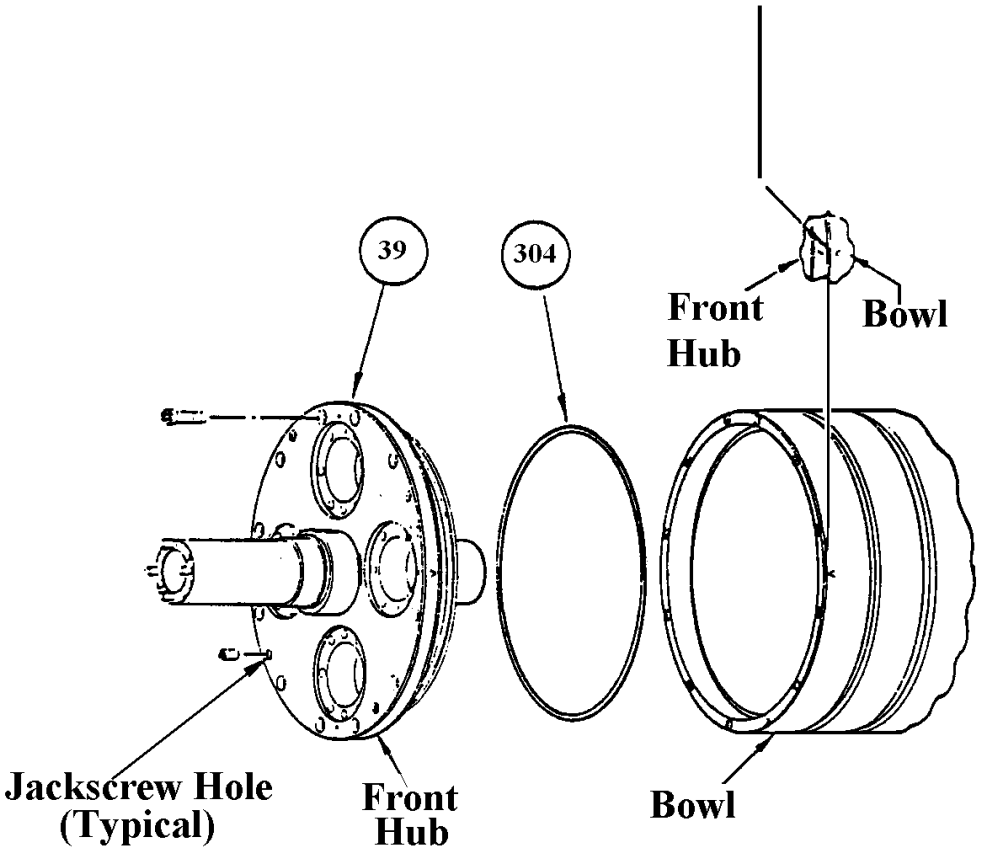
1. Stamp the top of the pillow block assemblies with an “S” for solid and an “L” for liquid, also stamp the top with a “V” with the point directed toward the bowl assembly. Be sure to stamp the horseshoe covers and pillow block covers on both sides of the pillow also.
2. Remove the six (6) bolts that retain the two (2) horseshoe covers and remove the horseshoe covers.
3. Remove eight (8) bolts from the sheave and using jack bolts remove the sheave from the bowl hub.
4. For liquid hub, remove the gear flange.
5. Using a two (2) or three (3) jaw puller, remove the pillow block as an assembly. Put a plate across the top of the hub for the stud to push on.
6. Remove the two pillow block covers and remove the bearing from the housing.
7. Loosen the two (2) setscrews in the pillow block flingers and the case flingers and remove both from the hub.
8. Clean all parts thoroughly and assembly in reverse order.

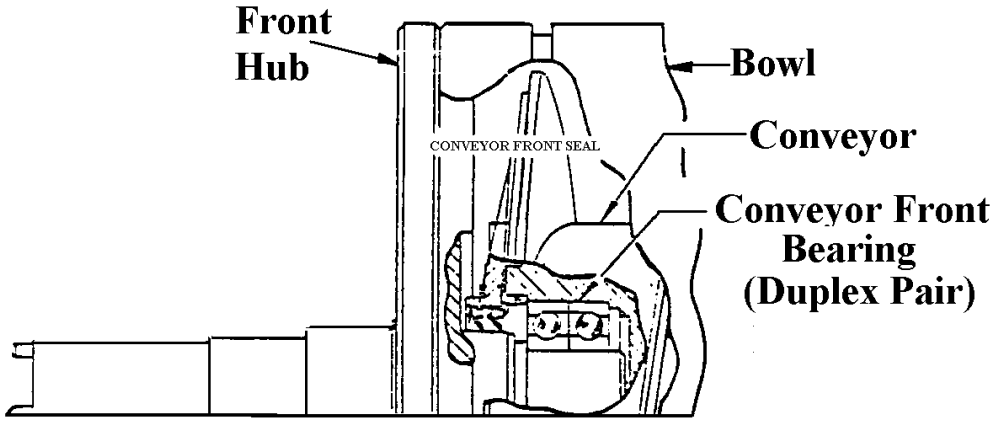
REAR PILLOW BLOCK ASSEMBLY
(SOLIDS AND LIQUIDS END)



BOWL FRONT HUB ASSEMBLY

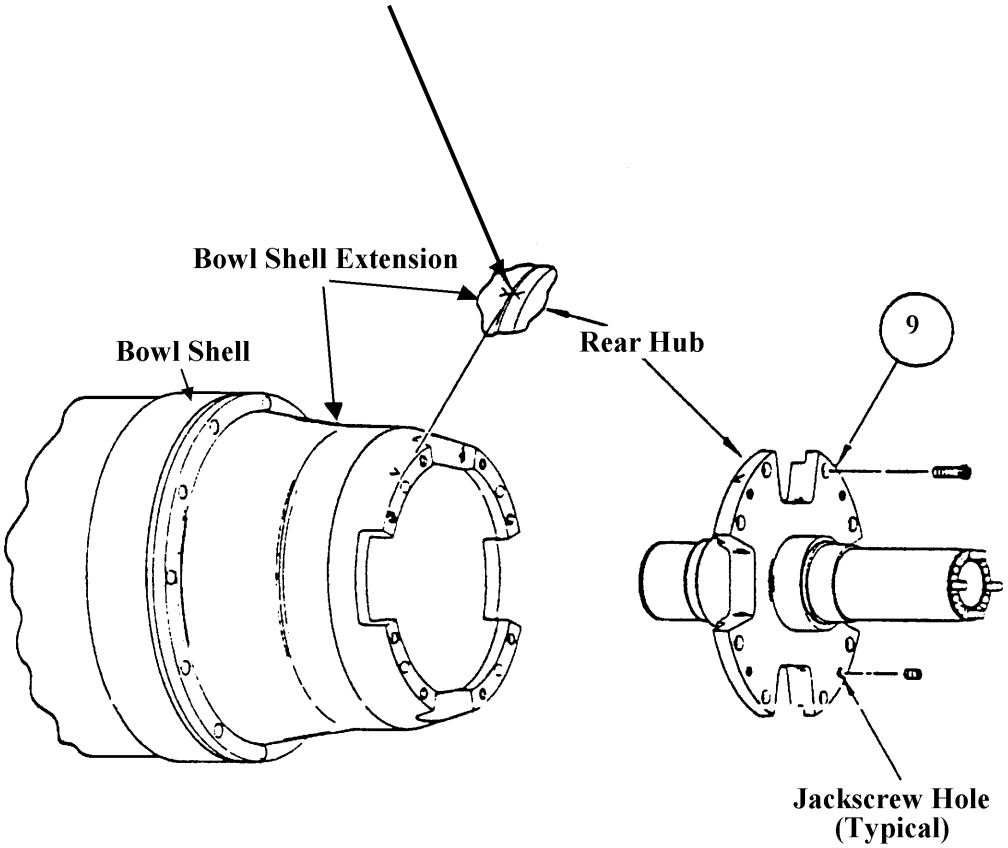
FRONT HUB AND BOWL SHELL ARE BALANCING AND STAMPED WITH BOWL ASSEMBLY: THEREFORE, THEY MUST BE REASSEMBLED WITH "V" MARKS IN LINE AS SHOWN





BOWL REAR HUB ASSEMBLY

REAR HUB AND BOWL SHELL EXTENSION ARE BALANCED AND STAMPED WITH BOWL ASSEMBLY: THEREFORE, THEY MUST BE REASSEMBLED WITH "V" MARKS IN LINE AS SHOWN



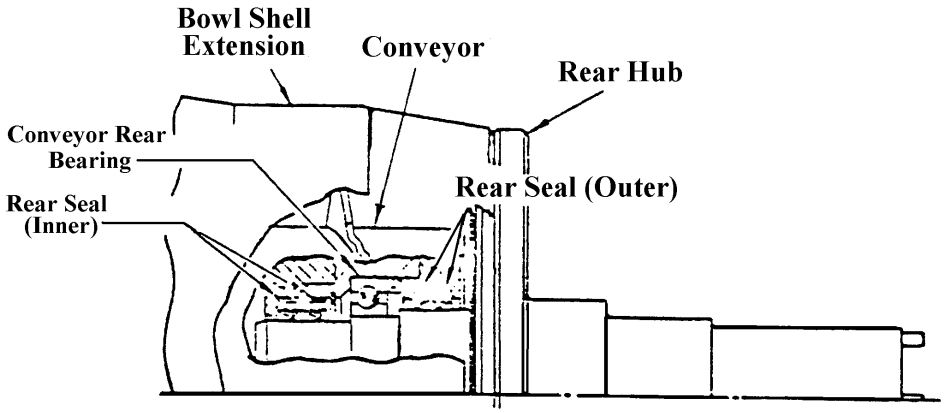
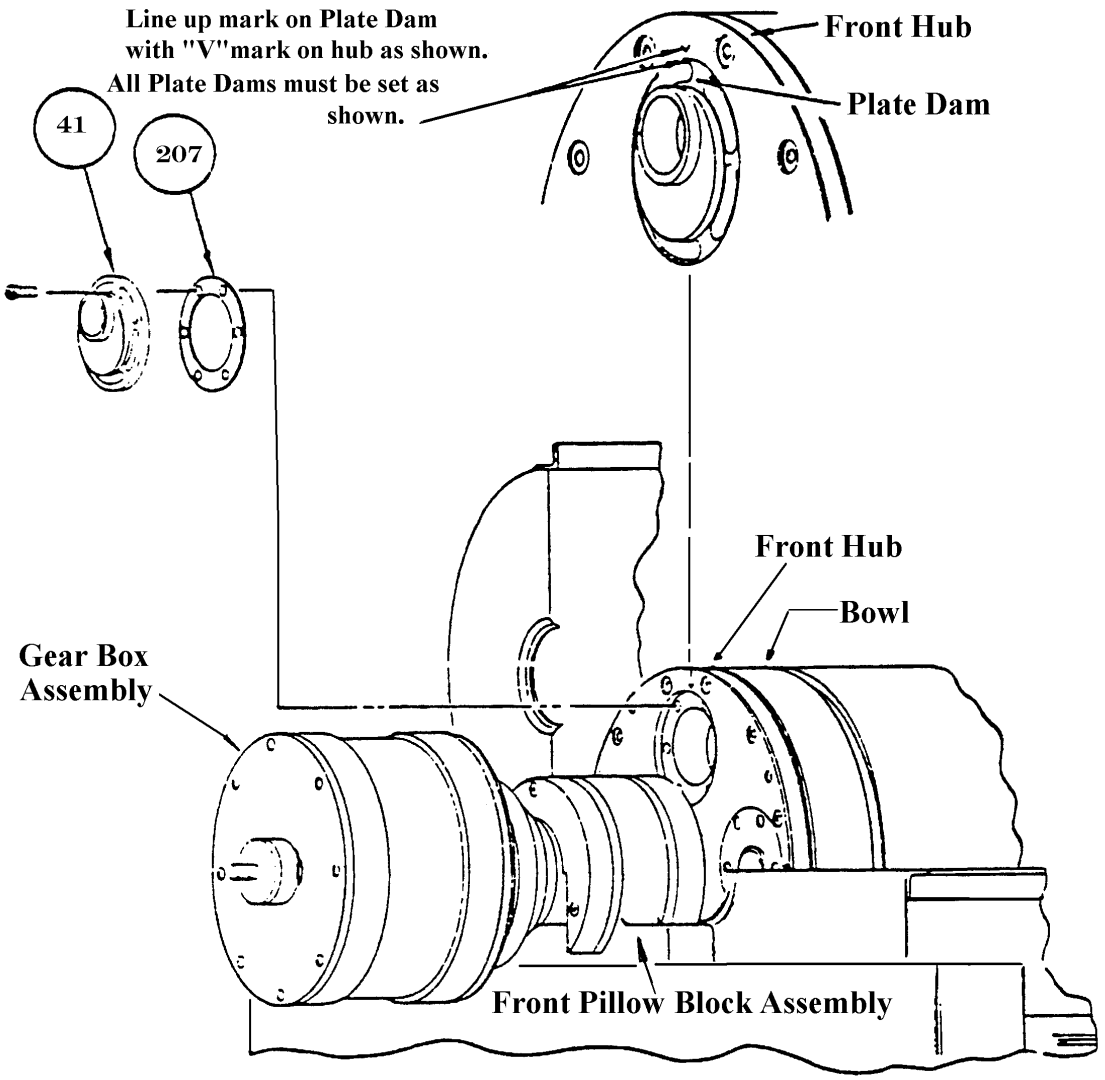


PLATE DAM ASSEMBLY



ASSEMBLY TIPS
MAINTENANCE CAUTIONS FOR
THE 5500 HIGH 'G' CENTRIFUGE

Bearings:

The inner and outer race must be replaced as a set.

Opened bearing, or cleaned parts should be kept covered until assembly.

Always use a thermometer to check the temperature of oil used to heat the bearings.

If no heat is used to install bearings, use only an arbor press to insert bearings in place.

Correctly lubricate all bearings before operating the centrifuge.

Do not wash new bearings with solvent before installing.

Keep new bearing wrapped and boxed until ready for use.

Seals:

Avoid touching the sealing surface. Keep seals wrapped in soft tissue until ready for installation.

Threaded Connections:

All threaded connections and pilot diameters should be wiped clean and lubricated with an anti-galling compound such as NEVER-SEEZ.

Torque all screws on the rotating assembly per the "Recommended Capscrew Seating Torque" charts shown in the Start-Up Section of this Manual. To help prevent capscrew failure – if excessive torque is required to seat mating parts during assembly, the over torqued screws should be removed, discarded and replaced with new screws installed at the correct torque.

O-Rings:

Inspect for nicks and cuts before installing, if damaged, do not install. Lubricate O-Rings for easier installation.

Machined Parts:

Clean with degreasing solvent before reassembly.

Set parts on clean work area and protect finished surfaces and openings on the part.
Be sure to align any balanced parts on the rotating assembly by matching the V-Marks stamped on the parts.

If more than one (1) centrifuge is owned, do not interchange any parts which comprise a balanced rotating assembly.

Some Assembly and Disassembly Tips

1. Read the Service Manual

2. Keep all mating surfaces free from dirt and handle carefully to avoid nicks and burrs to the mating surfaces.

3. Check the inside of the conveyor for solids build-up
   Not cleaning solids build-up can be the cause of vibration problems.

4. Lubricate O-Rings and fasteners when reassembling centrifuge components.
   Anti-seize compound should be used on stainless steel fasteners because of their tendency to gall when used with mating stainless steel parts.

5. Follow the recommended torque values shown in the torque chart in the Service Manual.

6. Conveyors equipped with carbide tiles should never be set down directly on a concrete floor. The carbide is very brittle and tile damage could result.

7. Monitor items such as drive belts, O-Rings, seals, and vibration isolators.
   These items will become brittle with age and deterioration will adversely affect centrifuge performance.
   Replace these items when indicated by inspection.

5500 HARDWARE INVENTORY

ITEM #	POSITION	QTY	ALLOY	TYPE	STYLE	SIZE	LOCK TIGHT OR NEVER SEIZE
				CONVEYOR			
1	ACCELERATOR PLATE	2	SS	SET/CUP	SOCKET HEAD	3/8" X 1"	242 LOCTITE
2	FEED NOZZLES	8	SS		SOCKET HEAD	1/2" X 3/4"	242 LOCTITE
3	SPLINE ADAPTER TO BRG. HSG.	8	BLACK		SOCKET HEAD	3/8" X 1"	NEVER SEIZE
4	SPLINE ADAPTER	4		DOWEL PIN		3/8" X 1"	
5	LIQ BRG HOUSING	12	BLACK		SOCKET HEAD	3/8" X 1 3/4"	NEVER SEIZE
6	LIQ BRG HSG SEAL COVER	6	SS		SOCKET HEAD	3/8" X 1 1/4"	NEVER SEISE
7	SOLID END BRG HSG	6	SS		SOCKET HEAD	5/16" X 3 3/4"	NEVER SEIZE
8	SOLID END BRG HSG SEAL COVER	(HELD BY ABOVE)					
				BOWL			
1	BOWL EXTENTION	12	SS		SOCKET HEAD	3/8" X 1 1/4"	NEVER SEIZE
2	SOLID END HEAD	8	SS		SOCKET HEAD	3/8"X 1 1/4"	NEVER SEIZE
3	SOLID END HEAD WEAR PLATE	8	SS		SOC.FLAT HEAD	3/8" X 3/4	242 LOCTITE
4	LIQ END HEAD	12	SS		SOCKET HEAD	3/8" X 2"	NEVER SEIZE
5	DAM PLATES	12	SS		SOCKET HEAD	5/16" X 7/8"	NEVER SEIZE
6	DISCHARGE PLOWS	28	SS		SOCKET HEAD	3/8" X 3/4"	242 LOCTITE

PILLOW BLOCK BEARINGS

(BOTH LIQ AND SOLIDS END ARE TYPICAL)

1	PILLOW BLOCKS TO BASE	8	BLACK	HEX HEAD	3/4 X 3"	NEVER SEIZE
2	END COVER	4	BLACK	SOC. FLAT HEAD	3/8" X 1"	NEVER SEIZE
3	HORSE SHOE COVER	12	SS	SOCKET HEAD	3/8" X 1 1/4	NEVER SEIZE
4	CASE FLINGER	2	SS	SET/CUP	5/16 X 1/2"	NEVER SEIZE
5	GREASE FLINGER	6	SS	SET/CUP	3/8" X 5/8"	NEVER SEIZE
6	GREASE ZERT	6	PLATED	HEX	1/8" NPT	N/A
7	GREASE RELIEF	1	PLATED	HEX	1/8" NPT	N/A

GEAR END

1	GEAR FLANGE	8	BLACK	SOCKET HEAD	3/8" X 1 1/4"	NEVER SEIZE
2	GEAR BOX	12	BLACK	SOCKET HEAD	7/16" X 1 3/4"	NEVER SEIZE
3	GEAR FLANGE TO HEAD	4	DOWEL PIN		1"	
4	GEAR FLANGE FOR HYD BD (ROTODIFF)	8	BLACK	SOCKET HEAD	1/2 X 1 1/4	NEVER SEIZE
5	ROTODIFF	12	BLACK	SOCKET HEAD	16MM X 60	NEVER SEIZE
6	GEAR FLANGE FOR HYD BD (ROTODIFF)	4	BLACK	DOWEL PIN	1/2 X 1 1/4	

SHEAVE

1	SHEAVE	8	BLACK	SOCKET HEAD	3/8" X 1 3/4	NEVER SEIZE
2	SHEAVE TO HEAD	4	DOWEL PIN		1"	

SUB BASE TO SKID SHOCK MOUNTS

1	SHOCK MOUNT TO SKID (LONG SKID)	16	SS	HEX HEAD	1/2" X 1 1/4" FLAT AND LOCK WSHR.	NEVER SEIZE
2	SHOCK MOUNT TO SKID (STD. SKID)	12	SS	HEX HEAD	1/2" X 1 1/4" FLAT AND LOCK WSHR.	NEVER SEIZE

SUB BASE TO SHOCK MOUNT

1	BOLT THROUGH SUB BASE	8	SS	HEX HEAD	5/8" X 3 1/2" FLAT AND LOCK WSHR	NEVER SEIZE
2	NUTS UNDER SHOCK MOUNT	8	SS	EXTRA HEAVY	5/8"	

BASE TO SUB BASE

1	BOLTS THROUGH BASE	4	SS	HEX HEAD	5/8" X 4 1/2" FLAT AND LOCK WSHR	NEVER SEIZE
2	FEED TUBE ARM TO BASE	4	SS	HEX HEAD	5/8" X 2" LOCK WSHR	NEVER SEIZE
3	FEED TUBE ARM CAP	6	SS	SOCKET HEAD	3/8" X 1 3/4"	NEVER SEIZE
4	EYE BOLT HOLES	4	SS	HEX HEAD	3/4" X 1 1/2" FLAT AND LOCK WSHR	NEVER SEIZE

CASE TO BASE

1	BOLTS THROUGH CASE TO BASE	8	SS	HEX HEAD	5/8" X 1 1/2" FLAT AND LOCK WSHR	NEVER SEIZE
2	TEFLON IN CASE	6	SS	HEX HEAD	5/16 X 1" FLAT AND LOCK WSHR	NEVER SEIZE
3	COVER SAFETY PIN	1	PLATED	HITCH PIN	5/8" X 2	

GEAR GUARD

1	BOLTS THROUGH GUARD	6	SS	HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE
2	BACK DRIVE LOCK OUT PLATE	4	SS	HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE
3	BACK DRIVE LOCK OUT PLATE	4	SS	NUT	3/8" NUT	NEVER SEIZE

BELT GUARD

1	BOLTS THROUGH GAURD TO SUB BASE	6	SS	HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE
2	TORQUE BLOCK	4	BLACK	SOCKET HEAD	3/8" X 2"	NEVER SEIZE

MD MOTOR TO SUB BASE

1	MAIN DRIVE MOTOR MOUNT TO SUB BASE	4	SS	HEX HEAD	5/8" X 2" FLAT AND LOCK WSHR	NEVER SEIZE

ELECTRIC BACK DRIVE

BACK DRIVE

1	FLANGE BRGS. FOR AUTOGARD	4	SS	HEX HEAD	1/2" X 3" LOCK WSHR	NEVER SEIZE
2	BRG. MOUNT TO BACK DRIVE ARM	4	SS	HEX HEAD	1/2" X 1 3/4" FLAT AND LOCK WSHR	NEVER SEIZE
3	BACK DRIVE ARM TO BASE	4	SS	HEX HEAD	1/2" X 1 3/4" FLAT AND LOCK WSHR	NEVER SEIZE
4	GEAR GUARD	7	SS	HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE
5	LOCK OUT PLATE	4	SS	HEX HEAD	3/8" X 1 1/4" FLAT AND LOCK WSHR	NEVER SEIZE
6	BD MOTOR MOUNT TO SUB BASE	4	SS	HEX HEAD	1/2" X 1 3/4" FLAT AND LOCK WSHR	NEVER SEIZE
7	AUTOGARD ON SHAFT	1	BLACK SET/CUP	SOCKET HEAD	3/8 SET SCREW	242 LOCTITE

MAIN DRIVE

1	BELT GUARD	5	SS	HEX HEAD	3/8" X 1" FLAT AND LOCK WSHR	NEVER SEIZE

RECOMMENDED CAPSCREW SEATING TORQUE

Follow recommended seating torques when assembling all socket head cap screws.

Nominal Size	Recommended Seating Torque Coarse Thread (Lubricated)*	
1 /4	75 in lbs	6.25 ft. lbs.
5/16	135 lbs.	11.25 ft. lbs
3/ 8	240 in lbs	20 ft. lbs.
1/ 2	600 in lbs	50 ft. lbs

CHART I
(STAINLESS STEEL)

Nominal Size	Recommended Seating Torque			
	Coarse Thread Dry		Coarse Thread Lubricated*	
	Plain	Plated	Plain	Plated
1/ 4	150/13	112/9	120/10	90/7.5
5/16	305/25	230/19	245/20.4	185/15.4
3/ 8	545/45	410/34	435/36	330/27.5
1/ 2	1300/108	970/81	1040/87	775/65
3/ 4		3300/275	3520/293	2640/220

CHART 2
(ALLOY STEEL)
IN. LBS./FT. LBS

* Lubricate with “Never-Seez” or equivalent.

Flighting Tile Caution

Caution

The Flighting Tiles used on the 5500 conveyor may be the spray-on hard face type or the sintered tungsten carbide backing tile type.

The backing tile type is comprised of stainless steel backing plate, a sintered tungsten carbide tile and a copper/silver solder “sandwich” between the two.

Even though the rotating assembly is comprised of 316 S.S., the copper will not withstand attack by highly corrosive chemicals such as sulfuric and nitric acids.

If the copper/silver solder tile bond is attacked by corrosive chemicals, the result will be tiles coming loose during centrifuge operation.

To avoid this potentially costly problem, always check any chemicals for compatibility with copper/silver solder before attempting to introduce them into the centrifuge.

SECTION 7

PARTS LIST

PARTS LIST

To order parts contact:

Hutchison Hayes, L. P.
P. O. Box 2965
Houston, Texas 77252

3520 East Belt
Houston, Texas 77015
Tel: (713) 455-9600
Fax: (713) 455 7753
(800) 441 4850
Web site: www.hutch-hayes.com
Email: cbailey@hutch-hayes.com

The parts listed in this section are customer replaceable components, except for the machined items, which should be ordered from HH.

5500 CENTRIFUGE BASE UNIT PARTS LIST

Qty.	Part #	Description
2	2879	5500 Flange gasket
3	2926	Case hinge washer
1	2989	Solid head wear plate (2 per set)
16	3044	Hinge pin for lid clamp
19	3044P	Cotter pin
16	3047	Clamping shoe for case
16	3048	Eyebolt for clamping shoe
17	3049	Nut for clamping shoe
1	3056	Solid end discharge transition
1	3057	Liquid end discharge transition
1	3088	Relief grease fitting
7	3089	Grease fitting
4	3123	Expanding dowel pins for PB
4	3441	Dam plates
2	3710	Warning stickers
1	3994	Feed tube (Heavy Duty)
4	4020	O-ring, feed nozzle
1	4021	O-ring, liquid end seal housing - Inner
2	4022	O-ring, accelerator plate
1	4023	O-ring, solid end seal housing
1	4024	O-ring, liquid end seal housing - Outer
2	4025	O-ring, bowl ext. and liquid head
2	4031	Seal, solid end conv. Bearing Housing
4	4032	Seal, sol. And Liquid Seal Housing.
1	4034	Case cover assy.
1	4036	Rtn. Ring
1	4037	Rtn. Ring
1	4040	Bearing, solid end conv.

5500 CENTRIFUGE BASE UNIT PARTS LIST (CONTINUED)

Qty.	Part #	Description
2	4041	Bearing, liquid end conv.
1	4042	Bearing, solid end PB
1	4043	Bearing, liquid end PB
1	4050	Solid end bowl hub
1	4051	Liquid end bowl hub
1	4052	Bowl extension
1	4053	Axial flow conveyor
1	4054	Solid end conv. Bearing Housing
1	4055	Liquid end conv. Bearing Housing
1	4056	Accelerator plate
4	4057	Feed nozzle with carbide insert
2	4058	Pillow block
4	4059	Pillow block cover
3	4060	Horse shoe cover
1	4061	Sheave for bowl
4	4062	Wear inserts plows
1	4063	Liquid end conv. seal housing
1	4064	Gear flange
1	4065	Bowl assembly with liner
4	4068	Dam plate gasket
1	4072	Horse shoe cover gear end
3	4073	Pillow block flinger
1	4078	Spline adapter
1	4080	Rtn. Ring for sol. End seal housing
2	4081	Pillow block spacer
1	4083	Solid end conv. Seal housing
2	4084	Case flinger
1	4091	Base assy.
1	4098	Nameplate

5500 CENTRIFUGE BASE UNIT PARTS LIST (CONTINUED)

Qty.	Part #	Description
1	4100	GB-53 gearbox
1	4779	Teflon wear liner for case

5500 HYDRAULIC BACKDRIVE PARTS LIST

Qty.	Part #	Description
1	2927	MOTOR, 60 HP, EXP. PROOF, C-FACE
1	2941	CONTROL PANEL, 5500 W/ HYD. BACK DRIVE
1	3061	SPLINE SHAFT 5500 TO 1071D-GV-L ROTODIFF
1	3062	GEAR FLANGE 5500 FOR 1071D/GV-L ROTODIFF
1	3071	HYDR SLIP DRIVE ROTODIFF 1071 D-GV/L
1	3072	HYDR PUMP UNIT TYPE C 45-100K W/O MOTOR
6	3164	ISOLATOR 1448 (STARTOR RACK)
4	3178	ISOLATOR, 1448 (BASE OR SUB BASE)

5500 HYDRAULIC OIL FIELD SKID PARTS LIST		
Qty.	**Part #**	**Description**
12	2654	Main drive Motor wire
1	2918	Gear guard
1	3083	Slide base 60 hp
1	3086	Main drive motor 60 hp
1	3121	Main drive v-belt
6	3164	Control panel isolators
1	3997	Main drive belt guard
1	3998	Oil fiel skid
1	3999	Sub base
6	4013	Skid isolators
1	4019	Dual drive motor sheave
1	4044	Centrifuge step sheave
1	3094	Vibration switch

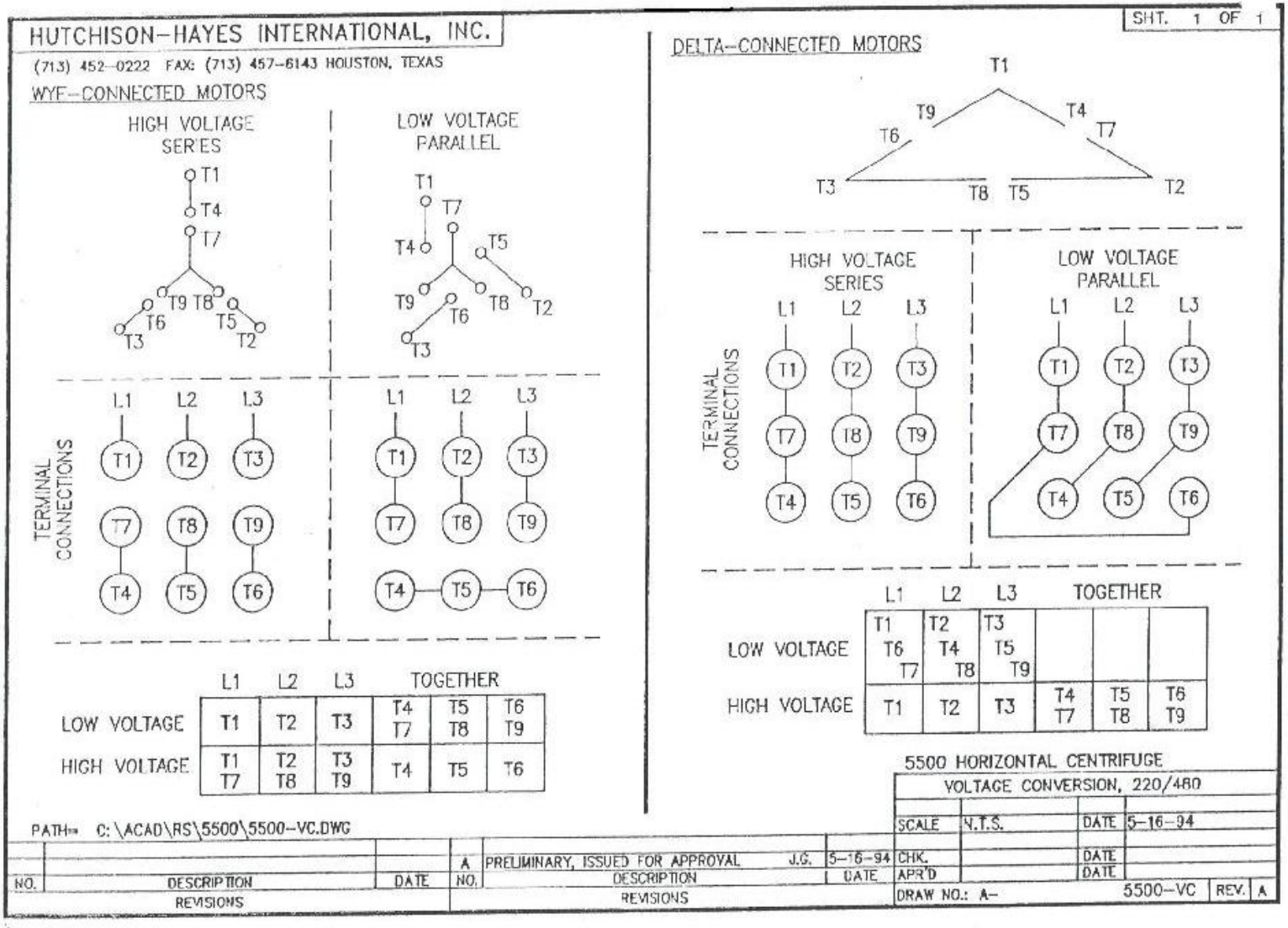
5500 HYDRAULIC BACKDRIVE CONTOL PARTS LIST			
Qty	**PART#**	**Mfr PN**	**Description**
1	4721	CA7-85-10-120	MAIN DRIVE CONTACTOR - CA7 85 10 120
1	4722	CEP7-A-85-8510	MAIN DRIVE OVER LOAD - CEP7 A85 8510
1	4723	CEP7-A32-32-10	BACK DRIVE OVER LOAD - CEP7 A32 32 10
1	4724	HMCP 100 R3C	MAIN BREAKER - HMCP 100R3C
1	4725	CO 250 E2AFB	TRANSFORMER - CO250 E2AFB
1	4728	CA 7-12-120	FEED PUMP CONTACTOR 10 HP 120V COIL
2	4729	GO2-GR12D-N34	PUSH BUTTON STOP/START
1	4730	KTA 7-25S-16A	FEED PUMP BREAKER - KTA7-25S-16A
1	4654		ISB BARRIER
1	4837	EXH1A8	HANDLE

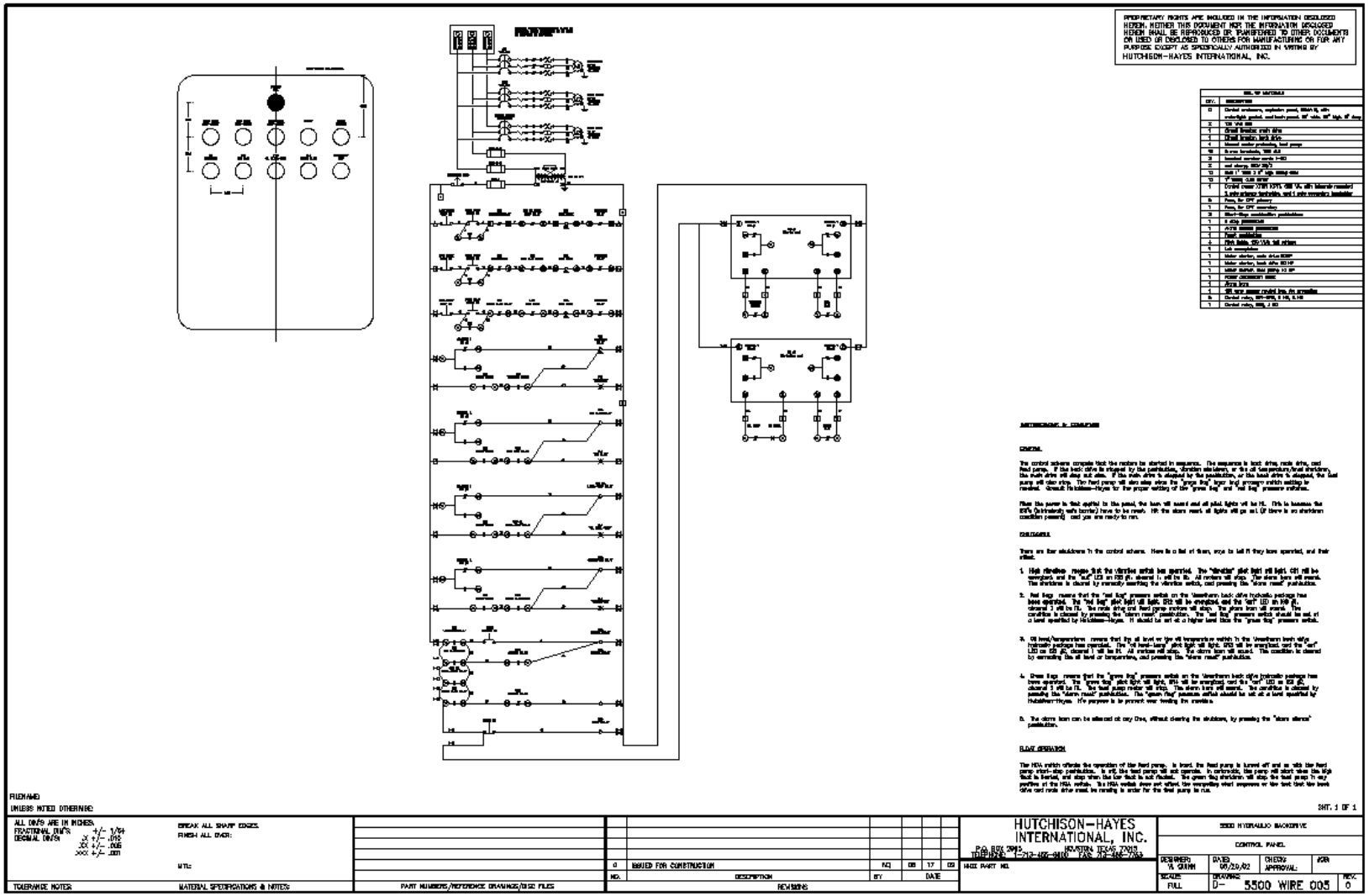
SECTION 7

ELECTRICAL & WIRING

WIRING SPECS
Cable size and length for 5500 Hydraulic Backdrive Unit

Main drive motor 60 HP	8'	6/4 gexol armored and sheathed	753-C 1 1/4"	753-C 1 1/4"
Back drive Hyd motor 60 HP	8'	6/4 gexol armored and sheathed	753-C 1 1/4"	753-C 1 1/4"
Vibration switch	6'	18/2 gexol armored and sheathed	753-O-1/2"	753-O-1/2"
High temp low oil switch	8"	1 Pair shielded	CGB 192	CGB 192
Red flag and Green flag switches	6"	1 Pair shielded	CGB 192	CGB 192
J box to panel	9"	4 Pair shielded	CGB 194	CGB 194


HUTCHISON-HAYES INTERNATIONAL, INC.
(713) 452-0222 FAX: (713) 457-6143 HOUSTON, TEXAS
SHT. 1 OF 1
WYE-CONNECTED MOTORS
HIGH VOLTAGE SERIES
LOW VOLTAGE PARALLEL
TERMINAL CONNECTIONS
L1 L2 L3
T1 T2 T3
T4 T5 T6
T7 T8 T9
L1 L2 L3 TOGETHER
LOW VOLTAGE T1 T2 T3 T4 T7 T5 T8 T6 T9
HIGH VOLTAGE T1 T7 T2 T8 T3 T9 T4 T5 T6
DELTA-CONNECTED MOTORS
T1 T9 T4 T6 T7 T3 T8 T5 T2
HIGH VOLTAGE SERIES
LOW VOLTAGE PARALLEL
TERMINAL CONNECTIONS
L1 L2 L3 TOGETHER
LOW VOLTAGE T1 T6 T7 T2 T4 T8 T3 T5 T9
HIGH VOLTAGE T1 T2 T3 T4 T7 T5 T8 T6 T9
5500 HORIZONTAL CENTRIFUGE
VOLTAGE CONVERSION, 220/480
PATH= C:\ACAD\RS\5500\5500-VC.DWG
SCALE N.T.S. DATE 5-16-94
CHK. DATE
APR'D DATE
DRAW NO.: A- 5500-VC REV. A
NO. DESCRIPTION DATE
A PRELIMINARY, ISSUED FOR APPROVAL J.G. 5-16-94
REVISIONS



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BILL OF MATERIALS

QTY.	DESCRIPTION
0	Control enclosure, explosion proof, NEMA 9, with color-light, gasket, and back-panel, 80" wide, 80" high, 8" deep
2	120 VAC 20A
1	Circuit breaker, main wire
1	Circuit breaker, back wire
1	Manual motor protecting, load pumps
10	3-wire terminals, 1000 AWG
3	Insulated corridor cards 1-20
2	end clamps, NEMA 20/3
10	duct 1" wide x 1" high, slotty-wire
10	1" wide, 1.25 DEEP
1	Control power 1/2HP 120V, 600 VA, with bifurcate transient 1 pole primary terminals, and 1 pole secondary insulator
5	Fuses, for CPT primary
1	Fuses, for CPT secondary
3	Short-Stop combination protectors
1	4 stop pushbuttons
1	AUTO manual pushbuttons
1	Panel mounting
4	Pilot lights, 120 VAC full voltage
4	Lab transformers
1	Motor starter, main drive 60HP
1	Motor starter, back drive 60 HP
1	MANUF MANUF. Rod 20HP, 10 HP
1	POWER DISCONNECT RING
1	Wire Ways
1	60 wire power routed line, for grounding
5	Control relay, 8PI-8PB, 8 NO, 8 NC
1	Control relay, 4PB, 2 NO

SEQUENCE OF OPERATION

CONTROL

The control scheme consists that the motors be started in sequence. The sequence is back drive, main drive, and feed pump. If the back drive is stopped by the pushbutton, vibration switch/alarm, or its all two-pressure/heat shutdown, the main drive will stop and also. If the main drive is stopped by the pushbutton, or the back drive is stopped, the feed pump will also stop. The feed pump will also stop when the "purge ring" type level pressure switch settings be reached. Consult Hutchison-Hayes for the proper setting of the "purge ring" and "ring" pressure switches.

When the power to that applied to the panel, the horn will sound and all pilot lights will be lit. This is because the PLC's (intrinsically safe barrier) have to be reset. Hit the alarm reset all lights will go out (if there is no shutdown condition present) and you are ready to run.

SHUTDOWNS

There are four shutdowns in the control scheme. Here is a list of them, ways to tell if they have operated, and their reset.

1. High vibration: means that the vibration switch has operated. The "vibration" pilot light will light, CR1 will be energized, and the "out" LED on PCB #1, channel 1, will be lit. All motors will stop. The alarm horn will sound. This shutdown is caused by manually resetting the vibration switch, and pressing the "alarm reset" pushbutton.

2. Feed bag: means that the "red bag" pressure switch on the Vanderhoorn back drive hydraulic package has been operated. The "red bag" pilot light will light, CR2 will be energized, and the "out" LED on PCB #1, channel 2 will be lit. The main drive and feed pump motors will stop. The alarm horn will sound. The condition is cleared by pressing the "alarm reset" pushbutton. The "red bag" pressure switch should be set at a level specified by Hutchison-Hayes. It should be set at a higher level than the "green bag" pressure switch.

3. Oil level/temperature: means that the oil level or the oil temperature switch in the Vanderhoorn back drive hydraulic package has operated. The "oil level-temp" pilot light will light, CR3 will be energized, and the "out" LED on PCB #1, channel 3 will be lit. All motors will stop. The alarm horn will sound. This condition is cleared by correcting the oil level or temperature, and pressing the "alarm reset" pushbutton.

4. Green bag: means that the "green bag" pressure switch on the Vanderhoorn back drive hydraulic package has been operated. The "green bag" pilot light will light, CR4 will be energized, and the "out" LED on PCB #1, channel 4 will be lit. The feed pump motor will stop. The alarm horn will sound. This condition is cleared by pressing the "alarm reset" pushbutton. The "green bag" pressure switch should be set at a level specified by Hutchison-Hayes. It's purpose is to prevent over heating the crankcase.

5. The alarm horn can be silenced at any time, without clearing the shutdown, by pressing the "alarm silence" pushbutton.

SLAVE OPERATION

The MSA switch affords the operation of the feed pump, as board. The feed pump is turned off and on with the feed pump start-stop pushbuttons. In off, the feed pump will not operate. In continuous, the pump will start when the high level is reached, and stop when the low level is not reached. The green bag shutdown will stop the feed pump in any position of the MSA switch. The MSA switch does not affect the emergency start sequence or the test feed the level drive card reset after reset be running in order for the feed pump to run.

SHT. 1 OF 1

FILENAME

UNLESS NOTED OTHERWISE:

ALL DIM'S ARE IN INCHES
FRACTIONAL DIM'S +/- 1/64
DECIMAL DIM'S .X +/- .010
.XX +/- .005
.XXX +/- .001

BREAK ALL SHARP EDGES
FINISH ALL OVER:

MTL:

TOLERANCE NOTES | MATERIAL SPECIFICATIONS & NOTES | PART NUMBERS/REFERENCE DRAWINGS/DISC FILES

NO.	DESCRIPTION	BY	DATE
0	ISSUED FOR CONSTRUCTION	MCJ	08 17 02

REVISIONS

HUTCHISON-HAYES INTERNATIONAL, INC.
P.O. BOX 3045
HOUSTON, TEXAS 77253
TELEPHONE: 1-713-466-5400 FAX: 713-466-7369

HHI PART NO.

5500 HYDRAULIC BACKDRIVE

CONTROL PANEL

DESIGNED	DATE	CHECK	JOB
W. CHAN	09/20/02	APPROVAL:	

SCALE: FULL | DRAWING: D- 5500 WIRE 005 | REV. 0

SECTION 8

TROUBLE SHOOTING

Centrifuge Trouble Shooting

(* Hydraulic Unit Only)

BEFORE PERFORMING ANY REMEDIES FOLLOW THE PROPER LOCK-OUT, TAG-OUT PROCEDURES

Problem	Possible Cause	Remedy
Unit will not start	Vibration switch tripped	Reset switch
	No power	Check source
	Blown fuses	Replace & trace cause
	Drive starter	Repair or replace
	Drive failure	Repair or replace
	Overheated Drive	Cool, restart, trace problem
	Torque control switch tripped *Low Oil Level *High Oil Temperature *Pump Unit in Red Flag Condition	Reset, trace problem Fill to Correct Level Wait till Oil Cools Correct Possible Pack-Off in Centrifuge
Centrifuge shuts down	Blown fuse	Replace, trace cause
	Overload relays tripped	Reset
	Overheated drive motor	Cool, trace cause
	Vibration switch tripped	Reset, trace cause
	Torque control switch tripped	Reset, trace cause
	*Red Flag over-Torque condition	Correct Pack-Off in Centrifuge
	*High Oil Temperature	Wait till Oil cools
	*Low Oil Level	Fill to appropriate level
Excessive Vibration	Isolators improperly secured	Tighten
	Flexible piping not used at machine connections	Repipe
	Conveyor flights plugged with solids	Flush or clean as required

	Conveyor dead chamber filled with product	Remove feed tube & flush conveyor with high pressure
	Loose fasteners or components	Tighten
	Gearbox or Rotodiff misaligned	Shim, recheck runout
	Pillow block or conveyor bearings damaged	Install new bearings.
	Bowl parts worn	Repair, replace, rebalance
	Conveyor flights worn	Repair, replace, rebalance
Concentrate not clear Solids not dry	Incorrect Pond Depth	Change setting
	Conveyor flights worn	Repair or replace
	*Wrong differential Speed	Change differential speed on pump unit
	Feed temperature too low	Readjust temperature
	Feed rate too high	Readjust
	Emulsification of liquids or degradation of solids	Pump speed is too high

(* Hydraulic Unit Only)

SECTION 9

ELEVATIONS, DIMENSIONS & WEIGHTS

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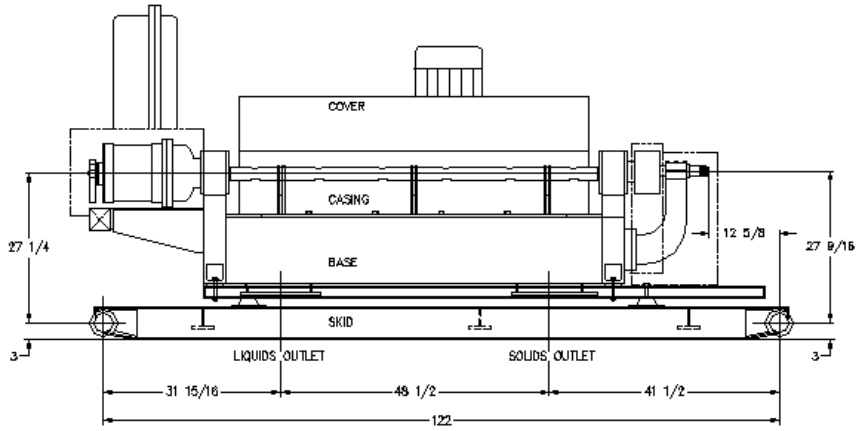
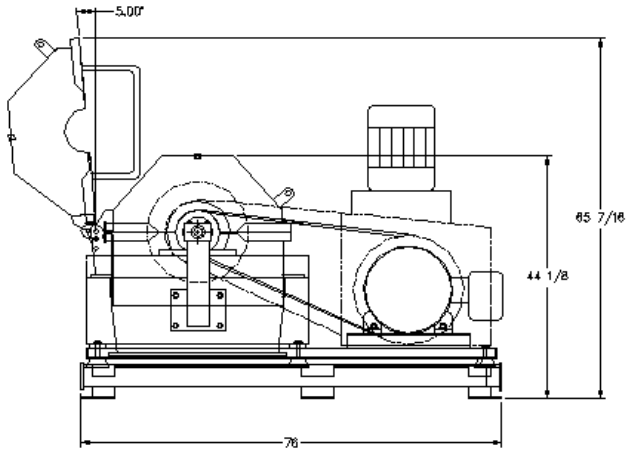


ELEVATION



SOLIDS END

FILENAME:

UNLESS NOTED OTHERWISE:

SHT. 1 OF 1

ALL DIM'S ARE IN INCHES
FRACTIONAL DIM'S +/- 1/64
DECIMAL DIM'S .X +/- .510
.XX +/- .005
.XXX +/- .001

BREAK ALL SHARP EDGES
FINISH ALL OVER

MTL:

TOLERANCE NOTES:

MATERIAL SPECIFICATIONS & NOTES:

PART NUMBERS/REFERENCE DRAWINGS/DISK FILES

NO.	DESCRIPTION	BY	DATE
0	ISSUED FOR REFERENCE	WQ	03 20 02

REVISIONS

HUTCHISON-HAYES INTERNATIONAL, INC.
P.O. BOX 2655
HOUSTON, TEXAS 77015
TELEPHONE: 1-713-453-8500 FAX: 713-455-7753

HHI PART NO.

FLOOR MOUNT HYDRAULIC

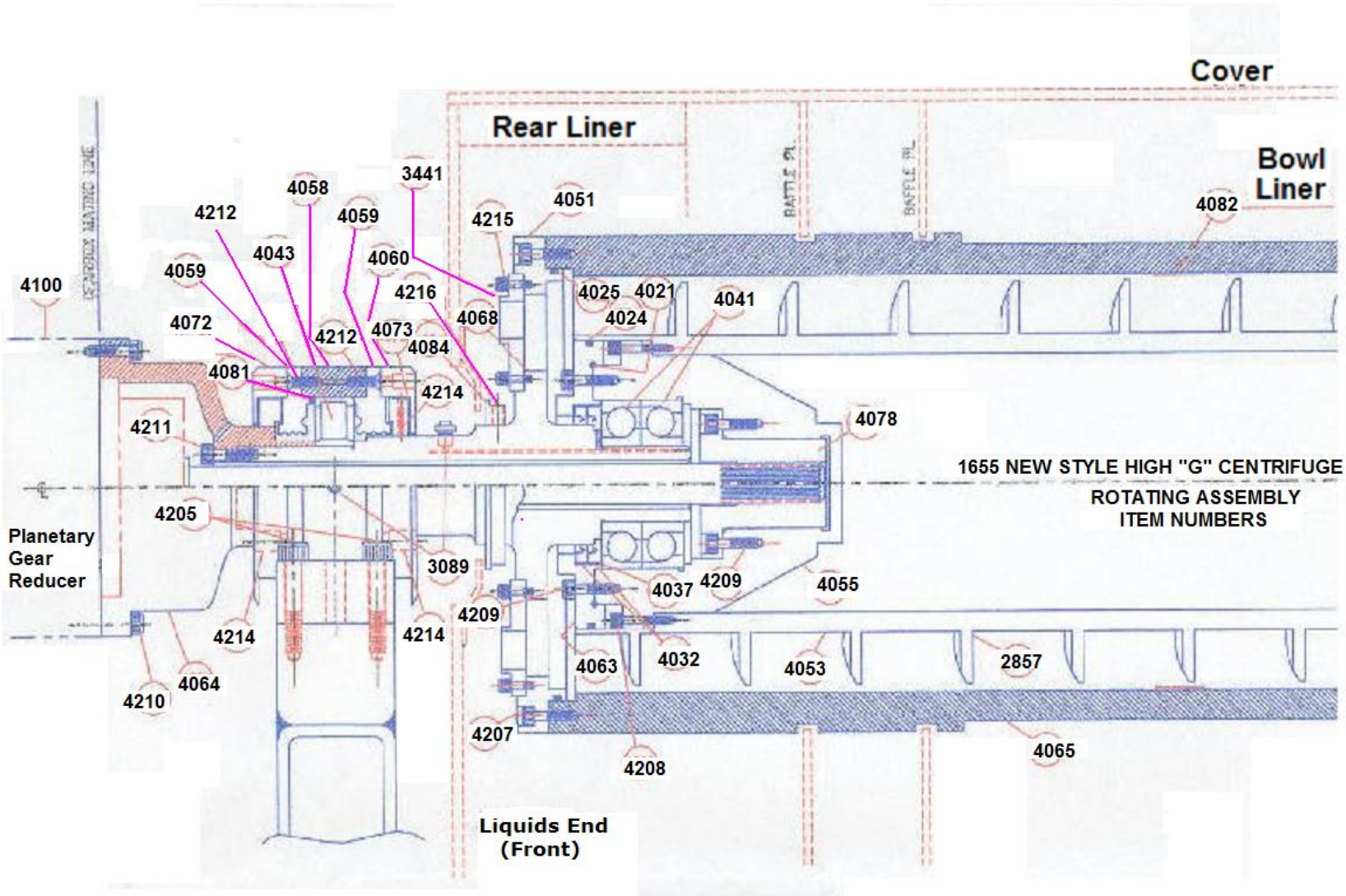
5500 CENTRIFUGE

DESIGNER:	DATE:	CHECK:	JOB:
V. GUINN	DW.RO/DS.	APPROVAL	

SCALE: FULL

DRAWING: D- 5500NS-HYDRAULIC

REV: 0


Cover
Rear Liner
Bowl Liner
BAFFLE PL
BAFFLE PL
4100
4058
3441
4212
4059
4043
4060
4059
4216
4072
4212
4073
4084
4081
4214
4211
4205
4051
4215
4082
4025
4021
4041
4024
4068
4078
1655 NEW STYLE HIGH "G" CENTRIFUGE
ROTATING ASSEMBLY
ITEM NUMBERS
Planetary
Gear
Reducer
3089
4037
4209
4055
4209
4214
4214
4063
4032
4053
2857
4210
4064
4207
4208
4065
Liquids End
(Front)

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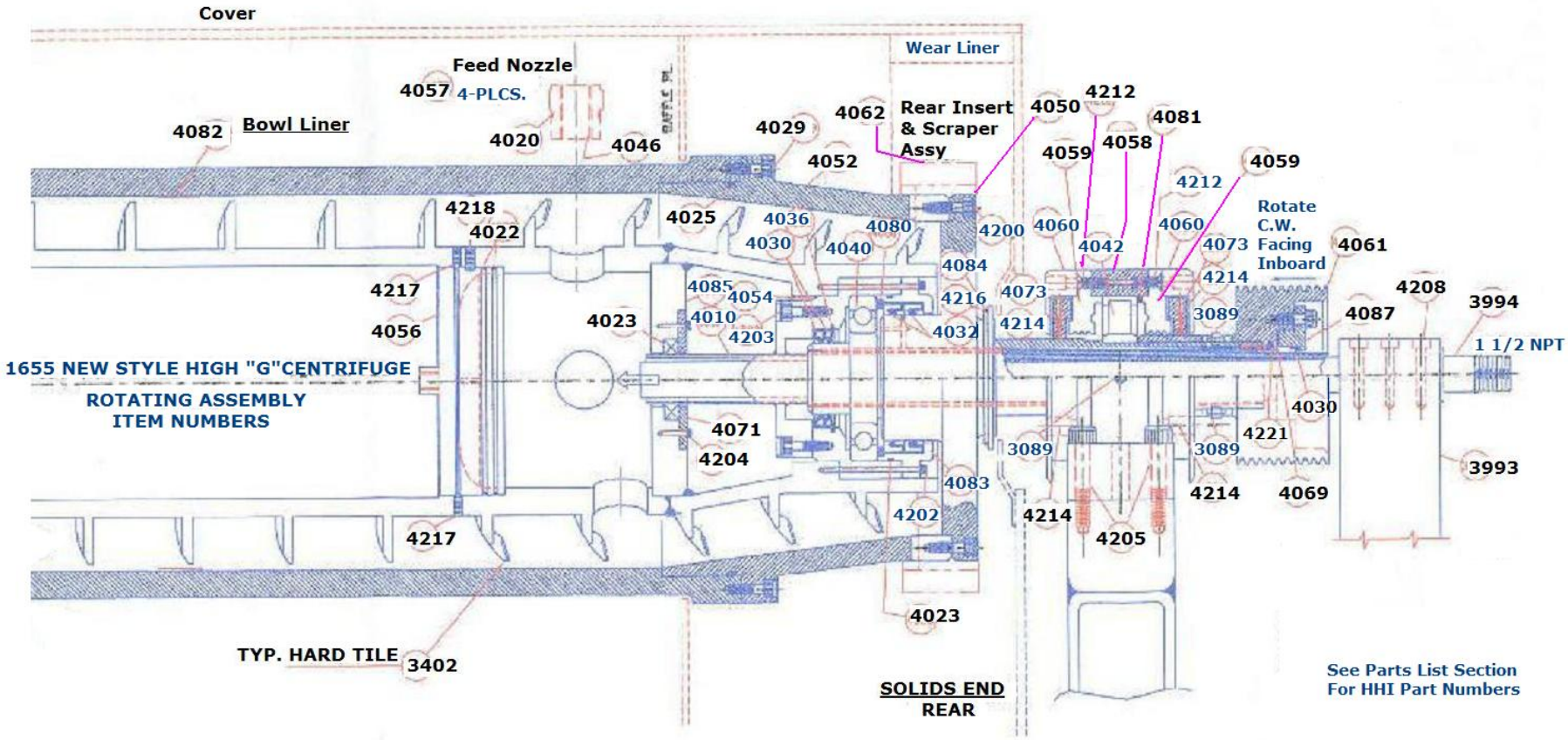


COMPONENT WEIGHTS AND DIMENSIONS

Description	Weight lbs.
5500 components	
5500 Variable Speed Skid Unit	8200
5500 Brake Smart Skid Unit	8300
5500 Oil Field Skid Unit	8200
5500 Hyd. Back Drive Unit	10400
5500 Full Hyd. Unit	12,800
5500 Base Unit	5,100
5500 Case and Cover	1,000
5500 Rotating Assembly (no g.b.)	2,000
5500 Bowl Assembly Complete (no conv.)	1250
5500 Conveyor Assembly Complete	750
GB 53 Gearbox	250
5500 Brake Panel	1100
VFD Control Panel	1,400

SECTION 10

MISCELLANEOUS

Recommended Spare Parts List for Two (2) Years Service
For the 5500 Centrifuge

HH Part	Quantity	Description	Item	Op Spares 2 Years
04043	1	Pillow Blk. Bearing, Front	(101)	4
04042	1	Pillow Blk. Bearing, Rear	(100)	4
04041	2	Conveyor Bearing, Front	(103)	8
04040	1	Conveyor Bearing, Rear	(102)	4
04032	2	Oil Seal, Solids End	(200)	8
04030	1	Oil Seal, Drivesheave	(203)	4
04032	2	Oil Seal, Liquids End	(204)	4
04068	4	Gasket, Plate Dam	(207)	16
04025	1	O-Ring, Bowl Extension	(301)	6
04031	2	Oil Seal, Retainer Tube	(201)	6
04024	1	O-Ring, Conveyor Liquid End	(305)	6
04025	1	O-Ring, Bowl Liquid End	(304)	6
04022	2	O-Ring, Accelerator Plate	(24D)	6
04023	1	O-Ring, Solids End Seal Housing	(300)	4
04020	4	O-Ring, Feed Nozzle	(303)	8
*04057	4	Feed Nozzle	(27)	8
*04062	4	Wear Insert/Scraper Assembly	(29)	8
04045	1	Drivebelt (3053 Bowl RPM)	(804)	2
04013	6	Vibration Isolators		12
02852	2	240 L. Filter		2
03121	1	V-Belt 3V-5GR1120 for 5500 Step Sheave		1

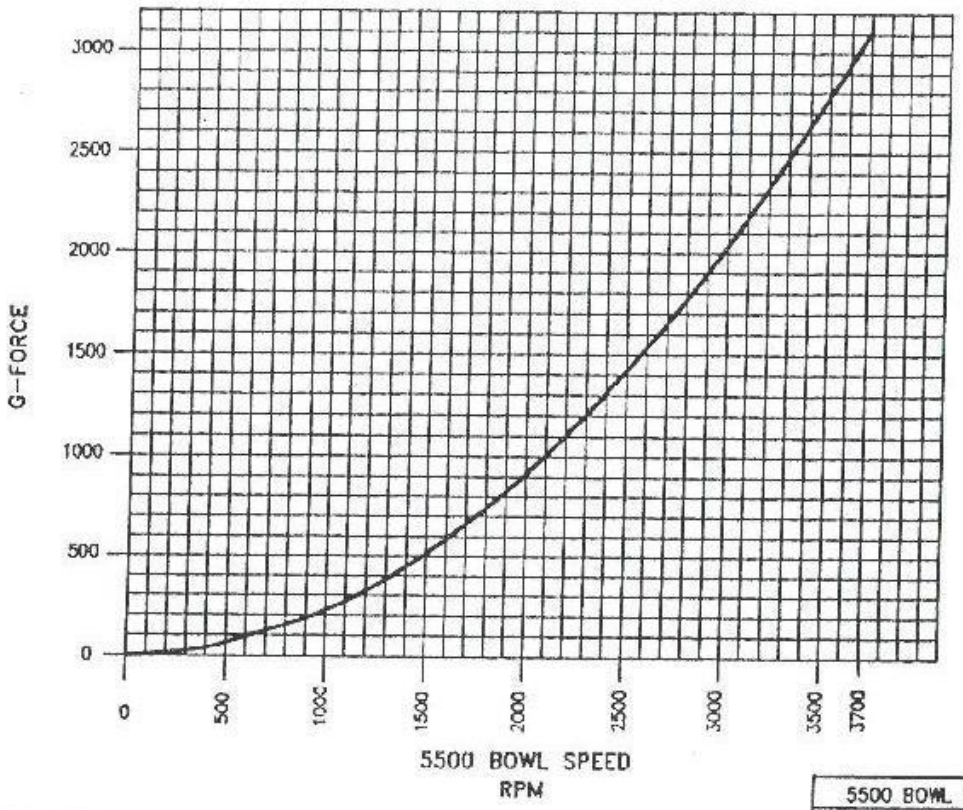
*Indicates Custom Part Available from HH Only

HUTCHISON-HAYES INTERNATIONAL, INC.

(713) 452-0222 FAX: (713) 457-6143 HOUSTON, TEXAS

SHT. 1 OF 1

HHI 5500 High "G" Centrifuge
BOWL SPEED VS. G-FORCE



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NO.	DESCRIPTION	DATE
	REVISIONS	

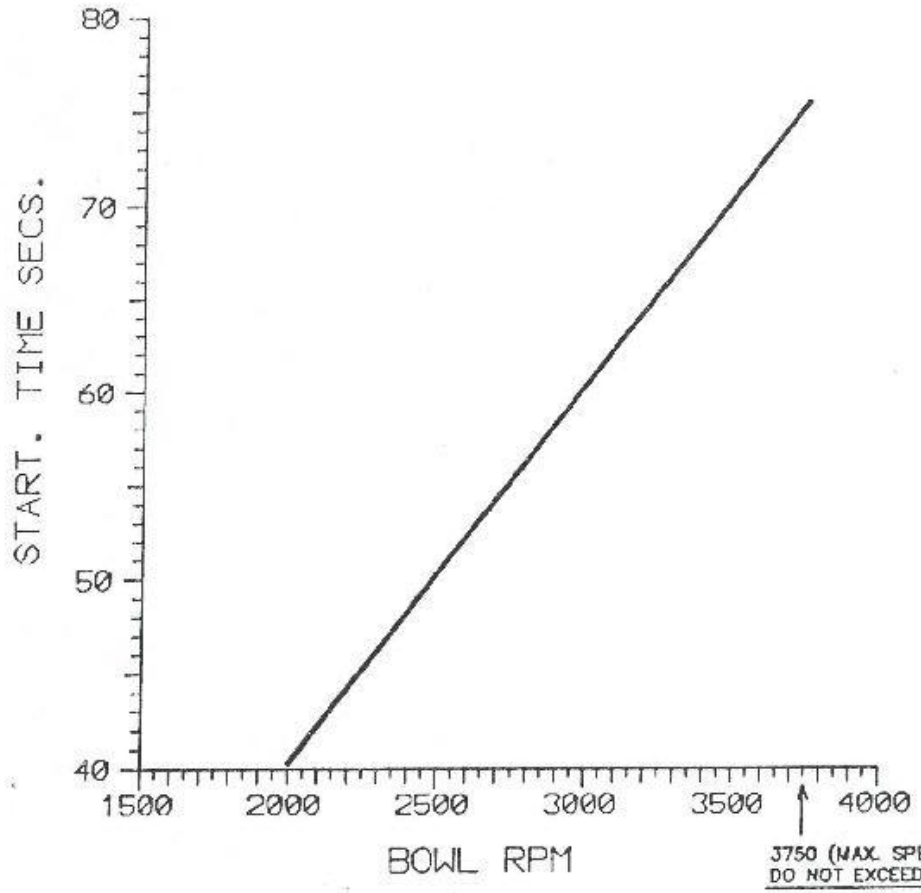
NO.	DESCRIPTION	DATE
B	ISSUED FOR CUSTOMER REF.	2-1-93
A	PRELIMINARY, ISSUED FOR APPROVAL	9-17-92
	REVISIONS	

5500 BOWL SPEED VS. CENTRIFUGAL FORCE			
HHR NO.		QTY.	
SCALE		DATE	9-17-92
CHK.		DATE	
APR'D		DATE	
DRAW NO.: A-	5500-GF-01	REV.	B

HUTCHISON–HAYES INTERNATIONAL, INC.

(713) 452-0222 FAX: (713) 457-6143 HOUSTON, TEXAS

SHT. 1 OF 1



NOTE:

GRAPH BASED ON COMPUTER PREDICTED PERFORMANCE.

MACHINE: 5500 HIGH "G" CENTRIFUGE

5500 START TIME (WYE-DELTA)

PATH= C:\ACAD\RS\START-55.DWG

NO.	DESCRIPTION	DATE
	REVISIONS	

NO.	DESCRIPTION	DATE
A	PRELIMINARY, ISSUED FOR APPROVAL	
	REVISIONS	

	JOB NO.	
	DATE DWN.	8-30-93
	DRAWN BY:	R.S.
CHK.	DATE	
APR'D	DATE	

DRAW NO.: A- START-55-01 REV. A

Storage of HH Centrifuge

Recommended indoor storage and rust prevention procedures for new horizontal decanting centrifuges (long-term storage implies periods in excess of three (3) months idle time.)

Note:
It is the responsibility of the owner to protect and maintain the equipment after shipment from HH.

If the centrifuge is not to be installed immediately after shipment, the unit should be left in the original factory packaging.

Centrifuge Assembly:

1. All accessible openings are closed with tape, overwrap, plugs, etc., for protection.

2. Nameplates are covered with tape.

3. Electrical devices such as the junction box, vibration shutdown switch, micro-switches, conduit boxes, etc., are wrapped with overwrap* and protective tape. *Overwrap refers to any self-adherent, grease, oil and waterproof material which can be molded around component parts.

4. The grease lubricated pillow block bearings are filled with the specified grease at the factory prior to shipment.

5. The planetary gearbox is filled with the specified lube oil at the factory prior to shipment.

6. The fluid coupling (located at the main drive motor output shaft) is filled with the specified oil at the factory.

Guidelines for Long Term Storage

1. The centrifuge should be stored in a building with a minimum temperature of 50 Deg. F. (10 Deg. C.). The storage area should be a clean, dry place free from excessive vibration, high humidity, dust, or corrosive fumes.

2. The unit should be tagged with instructions for startup after an extended period of storage.

3. Any loose parts should be boxed with rust inhibitor paper. No paper should be placed on the base of the box and machined unpainted surfaces should be coated with a rust preventive product.

4. The centrifuge assembly should be placed on a sturdy wooden platform. The platform boards should be spaced with 1/ 4” gap between the boards.

5. A protective waterproof shroud should cover the entire centrifuge assembly, top and four (4) sides.

Storage Maintenance

1. The centrifuge rotating assembly should be rotated by hand at least six (6) times every three (3) months.

2. Leave the sealed openings on the equipment closed.

3. Touch-up any damaged paint surfaces.

4. Do not paint rotating parts or threaded surfaces.

5. Motors should have their shafts rotated every three (3) months in order to keep the bearings lubricated and prevent rusting.

Coatings & Oils

At regular intervals during equipment storage, all exposed-machined surfaces unpainted steel parts, shafts, pipe fittings, etc., should be examined for signs of rust, pitting, and moisture.

These parts should be thoroughly cleaned and coated with the appropriate medium listed below:

1. Molykote Metal Protector (Dow Corning)

A wax type rust preventative, which may be sprayed, brushed, or dipped onto bare steel parts. This product dries to a hard, dry film, which is almost invisible.

For long storage periods, or shipment overseas, an overwrap must be used.

2. Rust Veto 342 (Houghton Co.)

A soft amber colored material leaving a transparent, dry plastic film on the coated part.

Applied by brushing, dipping or spraying, it is used for maximum heavy-duty protection on interior or exterior surfaces with or without a covering.

Before using the treated part, remove rust veto with solvent.

3. Rust Veto 377 (Houghton Co.)

A light, polar type water-displacing oil. It is used on metal parts stored indoors. It can be sprayed on intricate parts and bearings.

Long-term storage requires an overwrap. Removal from the treated part is not required before use.

An equivalent is “Antirust #77” WD Oil by International Chemical.

4. Rust Veto Concentrate (Houghton Co.)

A rust preventive that is mixed in one (1) part with nine (9) parts lubricating oil, or hydraulic oil, etc. It is circulated through gearboxes and hydraulic systems and then drained before shipment. It is compatible with most hydraulic oils and removal is not required before use.

5. Ferrocote 346 (Quaker Chemical Co.)

A heavy oil which leaves a soft, paste like film on the part surface. Used for outdoor storage, it must be used with overwrap. The treated part must have this coating removed with solvent before use.

Contact each Manufacturer as required to determine if the rust preventives are compatible with the type of oil you are using.

SECTION 11

VENDOR DATA

METRIX INSTRUMENT CO.
1711 Townhurst DR., Houston, TX 77043-2899
Tel: 713-461-2131 Fax: 713-461-8223
e-mail: techsvcs@metrix1.com

MW SERIES

INSTALLATION OF METRIX MODEL 5550 MECHANICAL VIBRATION SWITCH

This bulletin should be used by experienced personnel as a guide to the installation of the Model 5550 vibration switch. Selection or installation of equipment should always be accompanied by competent technical assistance. We encourage you to contact Metrix Instrument Co. or its local representative if further information is required.

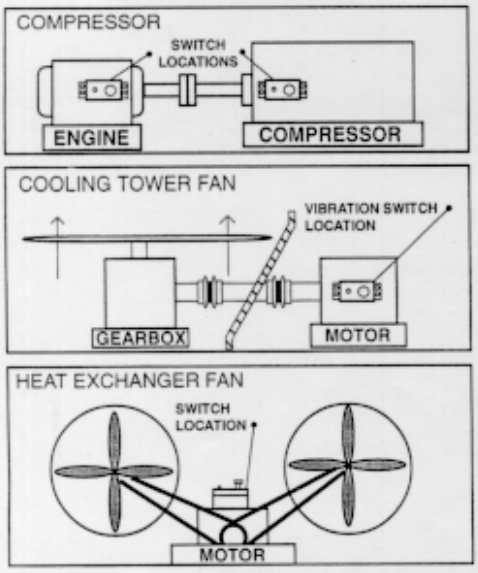
IMPORTANT: BEFORE PROCEEDING TO INSTALL AND WIRE THE UNIT, READ AND THOROUGHLY UNDERSTAND THESE INSTRUCTIONS.

THE SWITCH MODEL NUMBER SHOULD BE CHECKED TO CONFIRM THAT YOU HAVE THE CORRECT HAZARDOUS AREA RATING FOR YOUR APPLICATION. SEE HOW TO ORDER INFORMATION. "A"

INSTALLATION:

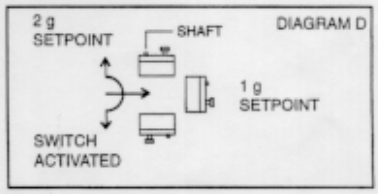
1) The sensitive axis of the vibration switch is perpendicular to the mounting base. The preferred mounting is with the sensitive axis in the horizontal plane, since most machines vibrate more in that plane. Mount the switch solidly to the frame of the machine.
2) Remove the cover and wire the switch(es) into the alarm or shutdown circuit. Do not exceed switch contact ratings listed in the specifications. **Keep field wiring away from the moving part of the mechanism.**
3) Observe all local electrical codes.

TYPICAL INSTALLATIONS



SETPOINT ADJUSTMENT:

1) The vibration setpoint adjustment is accessible externally. Turning the setpoint adjustment clockwise (CW) increases the vibration setpoint.
2) When the switch is shipped from the factory, the setpoint adjustment is set to 2g when installed in the vertical position and 1g when installed in the horizontal position (with reference to the setpoint adjustment shaft).
3) To check factory calibration, place unmounted unit in your hand and rotate per diagram D. The switch(es) should activate at dead bottom position. If necessary, adjust setpoint using the setpoint adjustment screw.



4) To preset switch at other than factory setpoint, start with step three (3) and then rotate adjustment screw 1/8 turn per g until you reach the required set point.
5) To adjust setpoint when installed on the machine, mount and wire the unit. Reset the switch by depressing the reset plunger and start the machine. When the machine has reached full speed, slowly turn the vibration setpoint adjustment counter-clockwise until the switch trips. Then turn the adjustment clockwise a small amount (approx. 1/8 turn). Reset the switch and restart the machine to determine whether the machine starting roughness will cause the switch to trip, in which case it may be necessary to increase the setpoint.

ELECTRICAL RESET AND STARTUP LOCKOUT:

The optional electrical reset circuit consists of an electrical solenoid in series with a thermistor. If the rated voltage is continuously applied to the reset circuit at machine startup, the reset solenoid energizes for a fixed time interval (approx. 30 sec.), after which time the solenoid is automatically de-energized by the thermistor. This action provides a trip lockout during machine startup roughness. The voltage must be removed from the reset circuit when the machine is stopped to allow the thermistor to cool off. The switch mechanism can then be reset electrically by a momentary application of the reset voltage or it can be reset manually.
NOTE: If the machine is restarted immediately after a shutdown, the lockout period will be shortened because the thermistor will be hot. An increase in the ambient temperature will also shorten the lockout period.

SPECIFICATIONS

Function: Armature mechanism trips on high vibration and operates snap action switch(es).

Amplitude Range: See How to Order. "C"

Frequency Range: 0 to 3600 RPM.

Setpoint Adjust: 0 to 100% of range. External setpoint adjustment.

Reset: Local reset, plus optional remote reset electrical coil. See How to Order. "D"

Start Delay: Applying reset coil voltage at start up holds mechanism from tripping for 20-30 seconds, after which the switch is active. Requires electric reset option.

Temperature Range: -40 C to 70 C

Enclosure: High strength copper-free (4/10 of 1% max) Aluminum alloy.

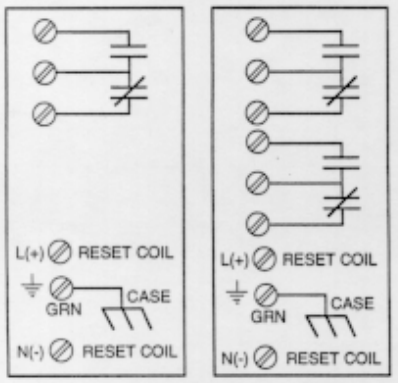
Environmental Rating: NEMA 4, IP 65 & CE Mark

Switch Contact(s) Rating: 15 amps, 125, or 480 Vac; 1/8 hp, 125 Vac; 1/4 hp, 250 Vac; 1/2 amp, 125 Vdc; 1/4 amp, 250 Vdc.

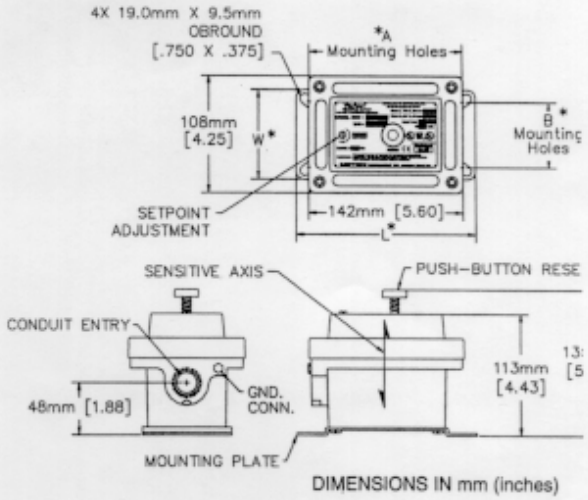
Hazard Rating: See How to Order. "A"

Weight: 2.1 kg (4.5 lbs.)

WIRING DIAGRAM



DPDT CONTACTS AND RESET COIL OPTIONAL



DIMENSIONS IN mm (inches)

How To Order...

MODEL A B C D E

5550 - ❑❑❑ - ❑❑

Example

5550 - 0 1 1 - 0 1

A ❑ Hazard Area Rating

- 0= None
- *1= UL, cUL Explosion Proof, Class I, Groups C & D, Div 1 Class II, Groups F & G, Div 1
- *2= UL, cUL Explosion Proof, Class I, Groups B, C & D, Div 1 Class II, Groups F & G, Div 1
- 3= CENELEC Flameproof, EEx d IIB T6
- 4= CENELEC Flameproof, EEx d IIB+H_2 T6

B ❑ Contacts

1= SPDT 2= DPDT

C ❑ Full Scale Range

1= 5 g 2= 2 g 3= 10 g

D ❑ Reset Coil & Start Up Delay

0= None 1= 115 VAC 2= 230 VAC 3= 24 VDC 4= 115 VDC

E ❑ Wiring Entry/Mounting Plate (retrofit)

- 1= 3/4" NPT/Metrix 5173 or 5175
- 2= 3/4" NPT/Metrix 5097; VS-2-EX; 366
- 3= 3/4" NPT/Metrix 5078; 365
- *4= M20 x 1.5/Metrix 5097; VS-2-EX; 366
- *5= Same as option 4 above with epoxy coated mounting plate

	(L)	(W)	(A)	(B)
E=1	165mm [6.50]	83mm [3.25]	141mm [5.56]	59mm [2.33]
E=2, 4	152mm [6.00]	121mm [4.75]	118mm [4.63]	79mm [3.12]
E=3	165mm [6.50]	121mm [4.75]	136mm [5.37]	92mm [3.62]

"How to Order" Note: For corrosive environments specify powder coating (added charge).

* **Note:** When option A1 or A2 is specified, options E4 and E5 are not allowed.

Assembly Instructions

NOTE: Tapers to be cleaned with suitable solvent and wiped dry prior to assembly. Do not use molybdenum disulfide or equivalent friction reducing compounds on fasteners or taper.

1. If seal and needle bearing are not in place in sheave hub, install them.
2. Install "O" ring in sheave hub. Mount sheave hub to coupling face using the six 12 point capscrews with "O" rings. Tighten capscrews to 27-30 lb.ft. torque.
3. Install ball bearing into front bearing carrier. Care must be taken not to damage front cover adjacent to flat head screws.
4. To install input shaft, seal bushing with "O" ring, end cap assembly, and retaining ring.
   a) Install input shaft through sheave hub and into taper in runner hub. Press shaft through ball bearing until it overhangs bearing 3/8 to 7/16 inch.
   b) Install seal bushing with "O" ring onto overhung end of shaft.
   c) If seal is not in place in end cap, install it.
   d) Mount end cap assembly with "O" rings and six 12 point capscrews with "O" rings. Tighten to 27-30 lb.ft. torque.
   e) Install roll pins in retainer washer. Place retainer washer with roll pins over shaft end making sure pins align with holes in shaft.
   f) Insert capscrew through retainer washer. Tighten capscrew to 177-195 lb.ft. torque.
   g) To install collet, loosen capscrew. Insert collet and engage screw hand tight for shipment purposes only.
5. Check air tightness with 5-10 psi pressure applied thru one fill hole.

Service Disassembly Instructions

1. Remove the two pipe plugs in the front cover and impeller. Then allow fluid to drain completely.
2. Remove six 12 point capscrews and "O" rings from end cap and coupling. Remove end cap and "O" ring.
3. Remove hex head capscrew which retains the collet. Remove retainer washer with roll pins.
4. Remove seal bushing and "O" ring from shaft end.
5. Insert push rod* through hole in input shaft to bottom of tapped hole in collet. Use a capscrew* in end of input shaft and tighten against push rod to break taper between input shaft and collet. Use flats on shaft end to counter wrench torque on screw. It may be necessary to tap end of capscrew to break taper contact.
6. Remove input shaft and coupling assembly with sheave from collet. Remove the 3 capscrews retaining the sheave. Remove sheave from sheave hub.
7. Remove six 12 point capscrews and "O" rings from sheave hub and coupling. Remove hub assembly and "O" ring.
8. To remove roller bearing, pry retaining ring out of groove with screwdriver, starting at cut in end. If ring is type with slot in each end, compress ring with snap ring pliers to remove. Tap seal and bearing out of hub, using rod inserted at sheave end.
9. Remove pusher rod from collet. Remove collet from motor shaft.
10. To remove input shaft, support runner on a tube* and press input shaft from runner. Use plug against input shaft to protect threads in shaft.

NOTE: If the front cover and impeller assembly is damaged, the basic unit must be replaced.

Tools required for disassembly

1. Push rod (.50 dia. x 5.25 long steel hardened to R_c50 min.)
2. Tube (3.81 O.D. x 2.75 I.D. x 7.00 long)
3. Capscrew (3/4-10 NC x 1.00 long)

Recommended replacements for overhaul

1. Seals
2. Bearings
3. "O" rings

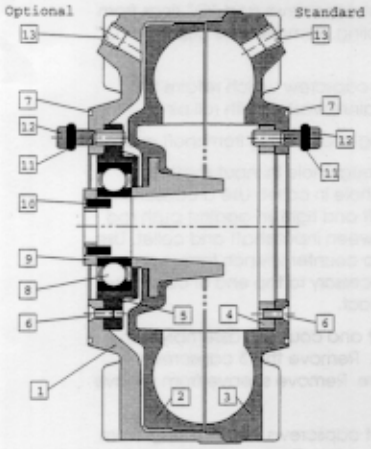
Repair Kit No.

P/N 8-612-005-001-2 - Major Repair Kit, includes 1, 2 & 3

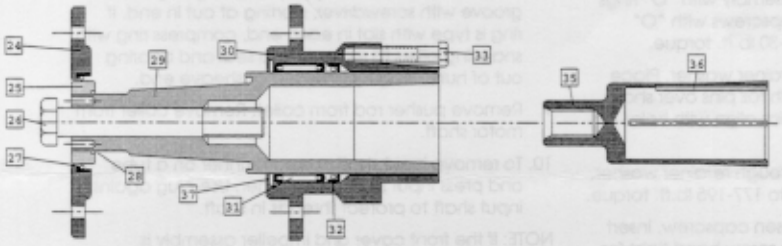
P/N 8-612-005-000-2 - Minor Repair Kit, includes 1 & 3 only.

Model HSD

Input and
Output Side



Base Unit
P/N 8-612-100-000-0



HSD Input and Output
P/N 8-612-005-003-4

Collet

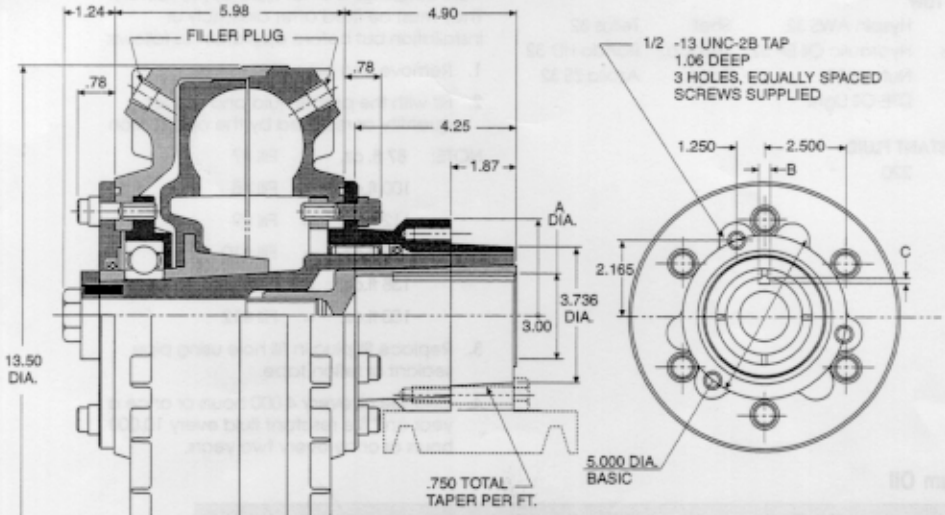
Item	Description	Qty.	Part Number
1	Front Cover	1	Items 1-6 are
2	Runner	1	components of
3	Impeller	1	subassembly
4	Retaining Ring	1	8-612-001-000-0
5	Input Bearing Carrier	1	
6	Flathead Capscrew	4	
7	O-Ring	2	2-756-064-000-2
8	Ball Bearing	1	2-701-015-003-1
9	Retaining Washer	1	4-612-026-000-4
10	Roll Pin	2	2-105-018-075-2
11	O-Ring	12	2-740-003-000-1
12	12 Point Screw	12	2-197-037-011-0
13	Fill Plug	2	2-221-003-420-1

Item	Description	Qty.	Part Number
24	End Cap	1	4-612-046-000-4
25	Seal Bushing	1	4-612-043-000-4
26	Draw Bolt	1	2-173-062-060-0
27	Oil Seal	1	2-730-020-001-0
28	O-Ring	1	2-740-015-001-2
29	Input Shaft	1	4-612-015-004-4
30	Sheave Hub	1	4-612-001-006-2
31	Needle Bearing	1	2-721-032-000-3
32	Oil Seal	1	2-730-032-001-1
33	1/2 NC 2-1/2 Blt.	3	2-172-050-024-0
35	Collet	1	See page 10
36	Step Key	1	See page 10
37	Snap Ring	1	2-745-042-001-1

Model HSD

Assembly No. see chart below

Input and Output — See chart below



Assembly No.	Collet Kit No.	Bore A	B	C
6-612-005-001-0000	8-612-005-005-5	1.625 - 1.627	.3750 - .3735	.182 - .177
6-612-005-002-0000	8-612-005-006-5	1.875 - 1.877	.5000 - .4985	.245 - .240
6-612-005-003-0000	8-612-005-007-5	2.125 - 2.127	.5000 - .4985	.245 - .240
6-612-005-004-0000	8-612-005-008-5	2.375 - 2.377	.6250 - .6235	.307 - .302

Installation Procedure

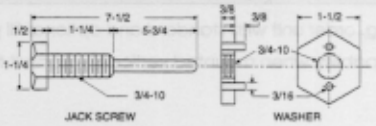
This fluid coupling (hydro sheave) is a complete unit and is to be installed on the end of a drive shaft with a sheave mounted on the fluid coupling. Install in the following sequence:

1. Install stepped key flush with end of drive shaft.
2. Install selected sheave to sheave assembly hub. Tighten capscrews to 40-44 lb.ft. torque.
3. Install coupling assembly on drive shaft. (It may be necessary to free the collet by pushing on loosened center capscrew.) Make sure collet does not ride up on any radius or shoulder on the drive shaft.

NOTE: Shaft must protrude into the collet 3.00 in. min. Tighten exposed center capscrew to 177-195 lb.ft. torque.

CAUTION: The hydro sheave is installed on the end on a shaft and it is essential that a guard be provided.

Suitable sheaves are available from many manufacturers. QD sheaves should be made for SD and SDS hubs.



Removal Tool
8-612-071-001-0

Vertical Mounting for HSD

When mounting vertically, the motor and collet should be mounted above the sheave and fluid coupling.

This position insures even the smallest oil fill will react with the motor. Also, this position allows for addition of and maintenance of the oil level within the fluid coupling.

Order unit with the standard and optional fill plugs.

WICHITA

Fluid Recommendation

OIL: SAE 10W

Castrol:	Hyspin AWS 32	Shell:	Tellus 32
Chevron:	Hydraulic Oil EP 32	Texaco:	Rando HD 32
Esso:	Nuto H 32	Total:	Azolla ZS 32
Mobil:	DTE Oil Light		

FIRE RESISTANT FLUID

Fyrquel: 220

Filling Instructions

Fluid couplings are not filled at the factory. They must be filled after assembly or installation but before operation as follows:

1. Remove one pipe plug.
2. Fill with the proper fluid and proper quantity as required by the application

NOTE:
- 87 fl. oz. = Fill #7
- 100 fl.oz. = Fill #8
- 112 fl.oz. = Fill #9
- 125 fl.oz. = Fill #10
- 138 fl.oz. = Fill #11
- 150 fl.oz. = Fill #12

3. Replace fill plug in fill hole using pipe sealant or teflon tape.
4. Change oil every 4,000 hours or once a year and fire resistant fluid every 10,000 hours or once every two years.

Petroleum Oil

HP	1200 RPM Coupling Size	1200 RPM Fill No.	1200 RPM % Slip	1800 RPM Coupling Size	1800 RPM Fill No.	1800 RPM % Slip	HP	KW
5	12.4	7	3				5	3.8
7-1/2	12.4	8	2-1/2				7-1/2	5.6
10	12.4	9	4				10	7-1/2
15	12.4	11	5	12.4	7	3	15	11.3
20	12.4*•	11-1/2	7	12.4	8	2-1/2	20	15.0
25	12.4*•	12	7	12.4	8-1/2	3	25	18.8
30				12.4	9	3-1/2	30	22.5
40				12.4	10	4	40	30.0
50				12.4	11	5	50	37-1/2
60				12.4	11	6	60	45.0

Note: For vertical mounting, order unit with standard and optional fill plugs.

Note: Reduced power capability when mounted vertically – consult factory.

Application Notes

1. Max allowable operating speed: All models 2400 RPM, except HSD - 1800 RPM.
2. Select sheave, verifying that:
   a. HP and speed of sheave and belts do not exceed manufacturers' recommendations.
   b. Sheave does not interfere with motor frame when motor shaft protrudes 3.00 in. min. into collet.

* In these applications, coupling will develop stall torque somewhat higher than motor breakdown torque.

• **Caution!** 7% or highr slips may cause overheating if coupling is cycled too rapidly.

For minimum operating temperatures below -10°F, Consult Warner Electric.

BALDOR®
MOTORS AND DRIVES

Explosion Proof AC and DC Motors

BALDOR
MOTORS AND DRIVES

Integral Horsepower
AC Induction Motors
ODP, WPI, WPII Enclosure
TEFC Enclosure
Explosion Proof

Installation & Operating Manual

7/02 MN400

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Section 1
General Information

Overview This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements. A Warning statement indicates a possible unsafe condition that can cause harm to personne . A Caution statement indicates a condition that can cause damage to equipmen..

Important: **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.**

Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Ins.allation and Use of Electr c Motors and Gene a.ors.
- The National Electrical Code
- Local codes and Practices

Limited Warranty

1. Baldor Electric motors are warranted for a period of one (1) year, from date of shipment from the factory or factory warehouse against defects in material and workmanship. To allow for stocking and/or fabrication period and to provide one year of actual service, the warranty period is extended for an additional period of six (6) months for a total of eighteen (18) months from the original date of shipment from the factory or factory warehouse stock. In no case will the warranty period be extended for a longer period. Baldor extends this limited warranty to each buyer of the electric motor for the purpose of resale and to the original purchaser for use.
2. Baldor will, at its option repair or replace a motor which fails due to defects in material or workmanship during the warranty period if:
   a. the purchaser presents the defective motor at or ships it prepaid to, the Baldor plant in Fort Smith, Arkansas or one of the Baldor Authorized Service Centers and
   b. the purchaser gives written notification concerning the motor and the claimed defect including the date purchased, the task performed by the Baldor motor and the problem encountered.
3. Baldor will not pay the cost of removal of any electric motor from any equipment, the cost of delivery to Fort Smith, Arkansas or a Baldor Authorized Service Center, or the cost of any incidental or consequential damages resulting from the claimed defects. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.) Any implied warranty given by laws shall be limited to the duration of the warranty period hereunder. (Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.)
4. Baldor Authorized Service Centers, when convinced to their satisfaction that a Baldor motor developed defects in material or workmanship within the warranty period, are authorized to proceed with the required repairs to fulfill Baldor's warranty when the cost of such repairs to be paid by Baldor does not exceed Baldor's warranty repair allowance. Baldor will not pay overtime premium repair charges without prior written authorization.
5. The cost of warranty repairs made by centers other than Baldor Authorized Service Centers **WILL NOT** be paid unless first authorized in writing by Baldor.
6. Claims by a purchaser that a motor is defective even when a failure results within one hour after being placed into service are not always justified. Therefore, Baldor Authorized Service Centers must determine from the condition of the motor as delivered to the center whether or not the motor is defect ve. If in the opinion of a Baldor Authorized Service Center, a motor did not fail as a result of defects in mater al or workmanship, the center is to proceed with repairs only if the purchaser agrees to pay for such repairs. If the decision is in dispute, the purchaser should still pay for the repairs and submit the paid invoice and the Authorized Service Center's signed service report to Baldor for further consideration.
7. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state

Note that **Baldor Super-E® Premium Efficiency** electric motors are warranted for a period of three (3) years. **Baldor IEEE 841** electric motors are warranted for a period of five (5) years.
All other terms and conditions of the Limited Warranty statement apply.

Safety Notice:

This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.

Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

WARNING: **Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.**

WARNING: **Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.**

WARNING: **This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.**

WARNING: **Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.**

WARNING: **Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.**

WARNING: **Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.**

WARNING: **Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.**

WARNING: **Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.**

WARNING: **Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.**

WARNING: **Do not use these motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.**

Safety Notice Continued

WARNING: **Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate.**

Specific service conditions for these motors are defined in NEC 70-599.

WARNING: **UL rated motors must only be serviced by authorized Baldor Service Centers if these motors are to be returned to a flammable and/or explosive atmosphere.**

Caution: **To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.**

Caution: **Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load from the motor shaft before moving the motor.**

Caution: **If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.**

Caution: **To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.**

Caution: **If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG-1 and MG-2 standards to avoid equipment damage.**

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Storage

If the motor is not put into service immediately, the motor must be stored in a clean, dry and warm location. Several precautionary steps must be performed to avoid motor damage during storage.

1. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
2. Do not lubricate bearings during storage. Motor bearings are packed with grease at the factory. Excessive grease can damage insulation quality.
3. Rotate motor shaft at least 10 turns every two months during storage (more frequently if possible). This will prevent bearing damage due to storage.
4. If the storage location is damp or humid, the motor windings must be protected from moisture. This can be done by applying power to the motors' space heater (if available) while the motor is in storage.

Unpacking

Each Baldor motor is packaged for ease of handling and to prevent entry of contaminants.

1. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
2. When the motor has reached room temperature, remove all protective wrapping material from the motor.

Handling

The motor should be lifted using the lifting lugs or eye bolts provided.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or the hood of a WPII motor.
2. When lifting a WPII (weatherproof Type 2) motor, do not lift the motor by inserting lifting lugs into holes on top of the cooling hood. These lugs are to be used for hood removal only. A spreader bar should be used to lift the motor by the cast lifting lugs located on the motor frame.
3. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc. it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. Do not lift using the motor lugs or eye bolts provided.

   If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Overview

Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include: coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

Location

The motor should be installed in an area that is protected from direct sunlight, corrosives, harmful gases or liquids, dust, metallic particles, and vibration. Exposure to these can reduce the operating life and degrade performance. Be sure to allow clearance for ventilation and access for cleaning, repair, service and inspections. Ventilation is extremely important. Be sure the area for ventilation is not obstructed. Obstructions will limit the free passage of air. Motors get warm and the heat must be dissipated to prevent damage.

These motors are not designed for atmospheric conditions that require explosion proof operation. They must NOT be used in the presence of flammable or combustible vapors or dust.

1. ODP motors are suitable only for indoor applications.
2. TEFC and WPII motors are suitable for indoor or outdoor standard service applications.

Mounting

The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Foundation rails and sole plates are designed to act as spacers for the equipment they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.

After installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

The standard motor base is designed for horizontal or vertical mounting. Adjustable or sliding rails are designed for horizontal mounting only. Consult your Baldor distributor or authorized Baldor Service Center for further information.

Alignment

Accurate alignment of the motor with the driven equipment is extremely important.

1. **Direct Coupling**
   For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.
2. **End-Play Adjustment**
   The axial position of the motor frame with respect to its load is also extremely important. The motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.
3. **Pulley Ratio**
   The pulley ratio should not exceed 8:1.
4. **Belt Drive**
   Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.

Caution: Do not over tension belts.

5. Sleeve bearing motors are only suitable for coupled loads.

Doweling & Bolting

After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor motors are designed for doweling.)

1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
2. Drill corresponding holes in the foundation.
3. Ream all holes.
4. Install proper fitting dowels.
5. Mounting bolts must be carefully tightened to prevent changes in alignment. Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure. Flanged nuts or bolts may be used as an alternative to washers.

Power Connection

Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices.

Conduit Box

For ease of making connections, an oversize conduit box is provided. The box can be rotated 360° in 90° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

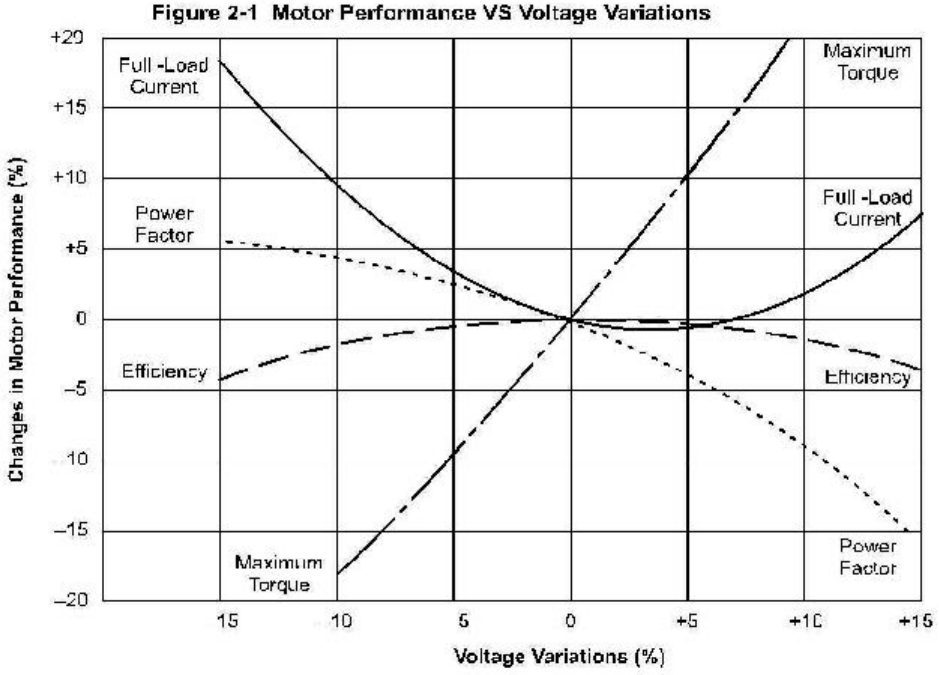
AC Power

Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:

1. AC power is within ±10% of rated voltage with rated frequency. (See motor name plate for ratings).
   OR
2. AC power is within ±5% of rated frequency with rated voltage.
   OR
3. A combined variation in voltage and frequency of ±10% (sum of absolute values) of rated values, provided the frequency variation does not exceed ±5% of rated frequency.

Performance within these voltage and frequency variations are shown in Figure 2-1.

Figure 2-1 Motor Performance VS Voltage Variations



First Time Start Up

Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Make sure that the mechanical installation is secure. All bolts and nuts are tightened etc.
2. If motor has been in storage or idle for some time, check winding insulation integrity with a Megger.
3. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
4. Be sure all shipping materials and braces (if used) are removed from motor shaft.
5. Manually rotate the motor shaft to ensure that it rotates freely.
6. Replace all panels and covers that were removed during installation.
7. Momentarily apply power and check the direction of rotation of the motor shaft.
8. If motor rotation is wrong, be sure power is off and change the motor lead connections. Verify rotation direction before you continue.
9. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.
10. After 1 hour of operation, disconnect power and connect the load to the motor shaft. Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.

Coupled Start Up

This procedure assumes a coupled start up. Also, that the first time start up procedure was successful.

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor through the coupling or the foundation. Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Jogging and Repeated Starts Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than that by the same motor under full load. If it is necessary to to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating - Duty rating and maximum ambient temperature are stated on the motor name plate. Do not exceed these values. If there is any question regarding safe operation, contact your local Baldor distributor or Baldor Service Center.

Section 3
Maintenance & Troubleshooting

WARNING: **UL rated motors must only be serviced by authorized Baldor Service Centers if these motors are to be returned to a flammable and/or explosive atmosphere.**

General Inspection

Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear. The following steps should be performed at each inspection.

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

Lubrication & Bearings

Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

Type of Grease

A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is Polyrex EM (Exxon Mobil).

Equivalent and compatible greases include:
Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

– Maximum operating temperature for standard motors = 110° C.
– Shut–down temperature in case of a malfunction = 115° C.

Lubrication Intervals

Recommended lubrication intervals are shown in Table 3-1. It is important to realize that the recommended intervals of Table 3-1 are based on average use.

Refer to additional information contained in Tables 3-2 and 3-3.

Table 3-1 Lubrication Intervals *

NEMA / (IEC) Frame Size	Rated Speed - RPM					
	10000	6000	3600	1800	1200	900
Up to 210 incl. (132)	**	2700 Hrs.	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)			3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)			* 2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (300)			*2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

* Lubrication intervals are for ball bearings. For roller bearings, divide the listed lubrication interval by 2.

** For 6205 and 6806 bearings. For 6807 bearings, consult oil mist lubrication (MN401).
Relubrication interval for 6205 bearing bearing is 1550Hrs. (using grease lubrication).
Relubrication interval for 6806 bearing bearing is 720Hrs. (using grease lubrication).

Table 3-2 Service Conditions

Severity of Service	Ambient Temperature Maximum	Atmospheric Contamination	Type of Bearing
Standard	40° C	Clean, Little Corrosion	Deep Groove Ball Bearing
Severe	50° C	Moderate dirt, Corrosion	Ball Thrust, Roller
Extreme	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion	All Bearings
Low Temperature	<–30° C **		

* Special high temperature grease is recommended (Dow Corning DC44). Note that Dow Corning DC44 grease does not mix with other grease types. Thoroughly clean bearing & cavity before adding grease.

** Special low temperature grease is recommended (Aeroshell 7).

Table 3-3 Lubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)					
	Bearing	OD D mm	Width B mm	Weight of Grease to add * oz (Grams)	Volume of grease to be added in^3	tea-spoon
Up to 210 incl. (132)	6307	80	21	0.30 (8.4)	0.6	2.0
Over 210 to 280 incl. (180)	6311	120	29	0.61 (7)	1.2	3.9
Over 280 to 360 incl. (225)	6313	140	33	0.81 (23)	1.5	5.2
Over 360 to 449 incl. (280)	6319	200	45	2.12 (60)	4.1	13.4
Over 5000 to 5800 incl. (355)	6328	300	62	4.70 (130)	8.2	30.0
Over 360 to 449 incl. (280)	NU319	200	45	2.12 (60)	4.1	13.4
Over 5000 to 5800 incl. (355)	NU328	300	62	4.70 (130)	8.2	30.0
Spindle Motors						
76 Frame	6207	72	17	0.22 (6.1)	0.44	1.4
77 Frame	6210	90	20	0.32 (9.0)	0.64	2.1
80 Frame	6213	120	23	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB

Note: Not all bearing sizes are listed. For intermediate bearing sizes, use the grease volume for the next larger size bearing.

Lubrication Procedure

Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your Baldor distributor or an authorized service center if a grease other than the recommended type is to be used.

Caution: To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your Baldor distributor or an authorized Baldor Service Center for additional information.

With Grease Outlet Plug

1. Clean all grease fittings.
2. Remove grease outlet plug.
3. If motor is stopped, add the recommended amount of grease.

   If motor is to be greased while running, a slightly greater quantity of grease will have to be added. Add grease slowly until new grease appears at shaft hole in the endplate or purge outlet plug.
4. Re-install grease outlet plug.

Without Grease Outlet Plug

1. Disassemble motor.
2. Add recommended amount of grease to bearing and bearing cavity. (Bearing should be about 1/3 full of grease and outboard bearing cavity should be about 1/2 full of grease.)

Note: Bearing is 1/3 full when only one side of bearing is completely full of grease.

3. Assemble motor.

Sample Lubrication Determination

Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43° C and the atmosphere is moderately corrosive.

1. Table 3-1 list 9500 hours for standard conditions.
2. Table 3-2 classifies severity of service as "Severe".
3. Table 3-3 lists a multiplier value of 0.5 for Severe conditions.
4. Table 3-4 shows that 1.2 in^3 or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

Accessories

The following is a partial list of accessories available from Baldor.
Contact your Baldor distributor for availability and pricing information.

Note: Space heaters and RTD's are standard on some motors.

Bearing RTD
RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor bearing during operation.

Bearing Thermocouples
Used to measure or monitor bearing temperatures.

Bearing Thermostat
Temperature device that activates when bearing temperatures are excessive. Used with an external circuit to warn of excessive bearing temperature or to shut down a motor.

Conduit Boxes
Optional conduit boxes are available in various sizes to accommodate accessory devices.

Cord & Plug Assembly
Adds a line cord and plug for portable applications.

Drains and Breathers
Stainless steel drains with separate breathers are available.

Drip Covers
Designed for use when motor is mounted in a vertical position. Contact your Baldor distributor to confirm that the motor is designed for vertical mounting.

Fan Cover & Lint Screen
To prevent build-up of debris on the cooling fan.

Nameplate
Additional stainless steel nameplates are available.

Roller Bearings
Recommended for belt drive applications with a speed of 1800 RPM or less.

Rotation Arrow Labels
Rotation arrows are supplied on motors designed to operate in one direction only. Additional rotation arrows are available.

Space Heater
Added to prevent condensation of moisture within the motor enclosure during periods of shut down or storage.

Stainless Hardware
Stainless steel hardware is available. Standard hardware is corrosion resistant zinc plated steel.

Winding RTD
RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor winding during operation.

Winding Thermocouples
Used to measure or monitor winding temperatures.

Winding Thermostat
Temperature device that activates when winding temperatures are excessive. Used with an external circuit to warn of excessive winding temperature or to shut down a motor.

Note: On some motors, leads for accessory devices are brought out to a separate conduit box located on the side of the motor housing (unless otherwise specified).

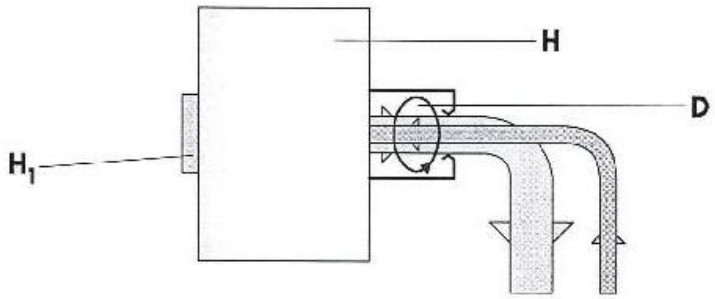
Table 3-5 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings. Tighten "Thru Bolts".
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately ¾ filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately ¾ filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately ¾ filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked are repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately ¾ filled.

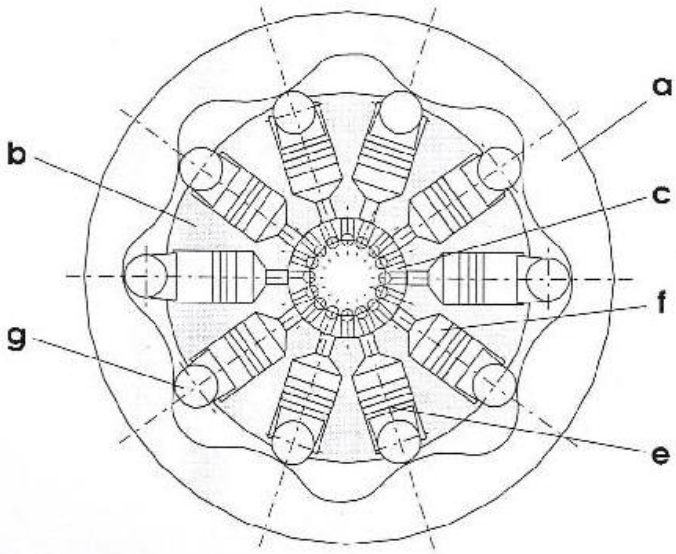
1.2 General description

The ROTODIFF drive produces a differential speed between the scroll and the bowl of the centrifuge. It consists of a slow speed high-torque hydraulic motor whose housing **(H)** is bolted to the bowl and whose drive shaft **(H1)** is joined to the scroll by a splined coupling.

The hydraulic oil is brought from the stationary to the rotary part of the motor by means of a transfer seal **(D)**.



The hydraulic motor is of the radial piston positive displacement type. The cam **(a)** transmits the force exerted by rollers **(g)** through pressure from pistons **(e)**. The tangential component of this force produces the rotation of rotor **(b)**. Pistons in cylinders **(f)** are subjected to fluid under pressure via distributor **(c)** which is mechanically linked to the cam. The cylinders are thus alternately connected to the high pressure of the hydraulic pack (working stroke) and the low pressure of the casing (return stroke).



1.3 Technical data

RD 1071 D - GV D.nr. 1-500.1170

Hydraulic motor complete with incorporated transfer seal

Physical data:	max pressure:	300 bar (relief valve setting)
	max torque:	8'920 Nm
	max cont. pressure:	250 bar
	max cont. torque:	7'434 Nm
	displacement:	1,868 litres/revolution
	max bowl speed:	4'500 rpm
	max diff. speed:	50 rpm
	configuration:	10 pistons / 8 lobes
Overall dimensions:	max diameter:	268 mm
	length:	429 mm
	weight:	80 kg
Flange dimensions:	bolt circle:	190 mm
	locating circle:	154,5 mm - h6
	mounting screws:	12 x M16
Hub spline:		N 65 x 2 x 30 x 31 x 9H, DIN 5480
Hydraulic data:	hydraulic fluid:	see list of SI-2 fluids
	filtration:	10 microns absolute
	recommendation:	pressurized filtration through noncollapsible filter element
	input fitting:	SAE 6000, PSI 3/4", DN 20
	output fitting:	SAE 3000, PSI 1", DN 25

Caution: Hydraulic hoses must comply with the DN values indicated. Should hydraulic hoses be more than 7 m long, please consult VISCOTHERM beforehand.
Return pressure as measured at the ROTODIFF output fitting must never exceed 0,9 bar when the fluid is at working temperature.
Recommended fluid temperature for continuous operation 40° - 50° C.
Absolute maximum temperature: 70° C

Direction of rotation: reversible clockwise / anticlockwise - works set
Max normal sound level: less than 70 dB (A)

Paint protection:	primer:	2 epoxy coats
	top coat:	epoxy finish

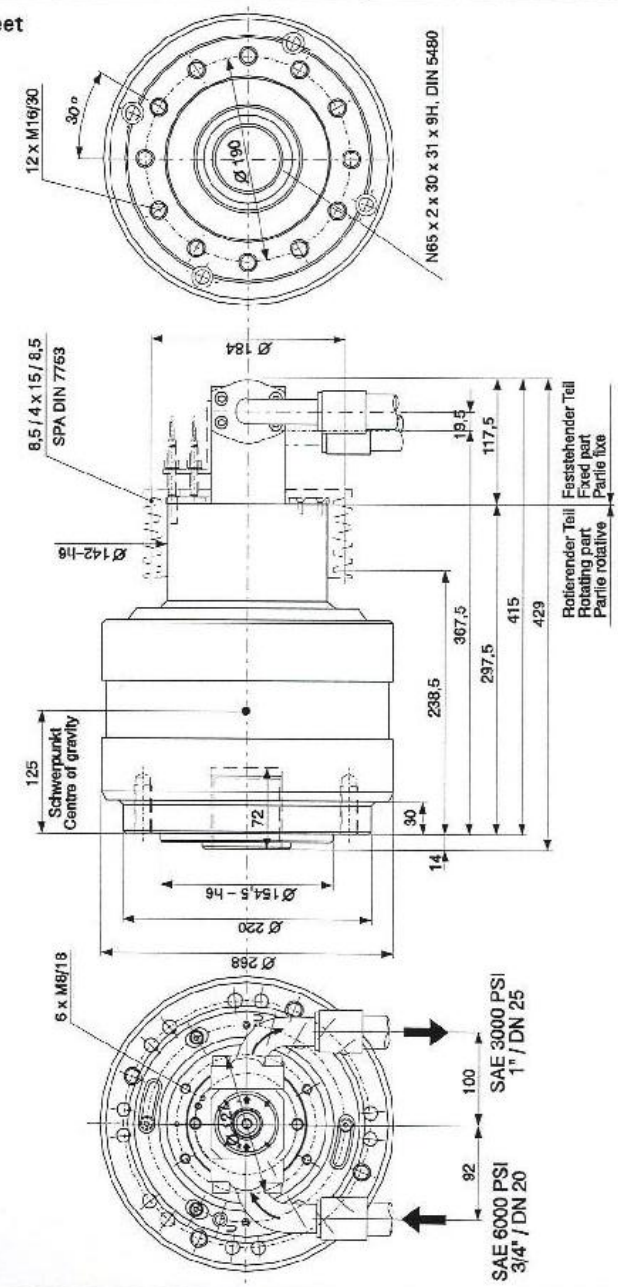
Options:

Vee belt grooves:	SPA, DIN 7753	5 grooves (4x15 mm)
Speed measurement:	scroll speed sensor bowl speed sensor	

Note: Scroll/bowl speeds as measured at ROTODIFF can be displayed on our monitoring and control instruments. Signals are digital but can be optionally converted to analogue for transmission at distance.

1.0 Instructions manual	Origin: / Verification: / Release:	BA-5060 e	Page 7 to 14
Type: ROTODIFF 1071 D - GV		D.Nr. 1-500.1170	
Note:		Date: 20.03.1998 / WG	

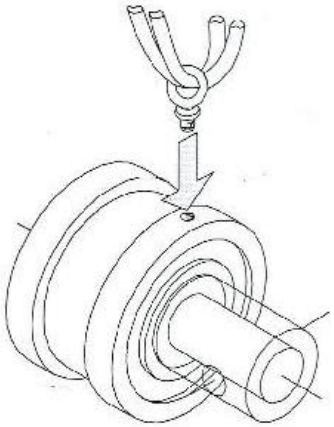
1.4 Technical dimension sheet



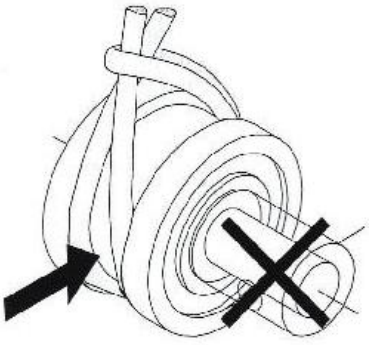
1.5 Unpack / Transport / Lifting

Note: Upon receipt, check that the ROTODIFF has no external damage (Transport damage). The ROTODIFF should be checked for correct conformity with the delivery papers. In the event of damage or missing parts VISCOTHERM must be immediately informed in writing.

Caution: Never lift, transport or use force on the stationary feed block, or possible damage to the block, shaft or seal may result.



Use ring screws to transport or lift the unit, with a sling, as shown.



If no ring screws are available, the ROTODIFF can be lifted with a sling only, as shown.

Note: Adjust the sling position to lift or transport the ROTODIFF horizontally as shown, take care the sling does not slip.

Take care that the ROTODIFF is correctly mounted and that the eccentricity is controlled - see 1.6 mounting of the equipment.

Caution: Only use bolts of correct steel quality.

1.6 Mounting of the equipment

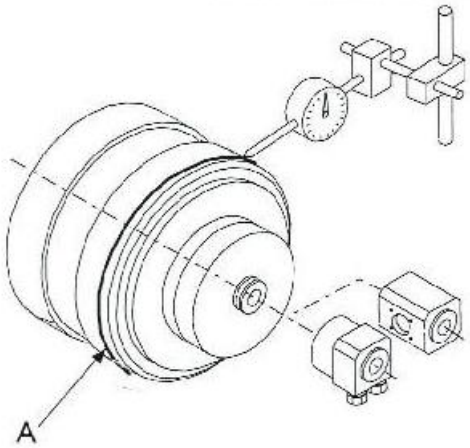
When the ROTODIFF drive has been joined to the scroll shaft and its flange located on the centering ring, the unit is screwed to the centrifuge via screws or threaded studs (not part of the VISCOTHERM supply) using the following torque:

200 Nm for M 16 / 8.8 grade screws

Caution: The flange material and screw head quality must be considered. When necessary, hardened steel washers should be used between the screws heads and flange.

Note: The torque is based on a design friction coefficient of 0,125 (normal grease). If bolts of any other steel quality are to be used, it is vital to contact VISCOTHERM beforehand.

When re-assembling use new attachment screws!



First clean unpainted surface **(A)**.
Alignment and centering of the ROTODIFF drive is measured by means of a dial gauge, its feeler resting on the bared track **(A)** on the ROTODIFF outer circumference.

Maximum allowable radial run-out:
0,2 mm (0,1 mm offset)

Note: When centering and aligning of the ROTODIFF are complete, take care to apply rust-protection to any bare metal parts.

1.7 Hose connections

- ➔ Take all due care to avoid penetration of dirt in the hydraulic lines while coupling them to the equipment. Remove all of the plastic caps and couplings protecting the hydraulic fittings and hoses.
- ➔ The high pressure ROTODIFF fitting (designated P) is a SAE 3/4" series HP fitting.
  The high pressure hose must conform to DN 20 (DIN 20023). The high pressure hose-fitting must be provided with a SAE, SFS 90 °, DN 20 (SAE J518).
- ➔ The low pressure ROTODIFF fitting (designated T) is a SAE 1" standard series fitting.
  The low pressure hose must conform to DN 25 (DIN 20021, part 2). The low pressure hose-fitting must be provided with a SAE, SFL 90 °, DN 25 (to SAE J518).

Note: The use of pipe fittings to DIN 2353 (e.g. SAE 24° crimp cone fittings) is strictly forbidden because they require a tightening torque which would overstress the ROTODIFF coupling system.
Avoid all bends in the hydraulic lines and take care that the hoses are not twisted.

Caution: **Never interchange the "P" and "T" ROTODIFF fitting or hoses as certain damage would result. Should it be necessary to rigidly fix the hydraulic hoses, take care to allow some freedom of movement of the connection to the ROTODIFF coupling block by leaving some distance between the block and the fixation point, or by providing for a flexible restraining arrangement.**

1.8 Setting the direction of rotation

Note: This work can be done on the ROTODIFF as assembled to the centrifuge and must be carried out with the equipment at rest, the hydraulic power pack cut off and depressurized.

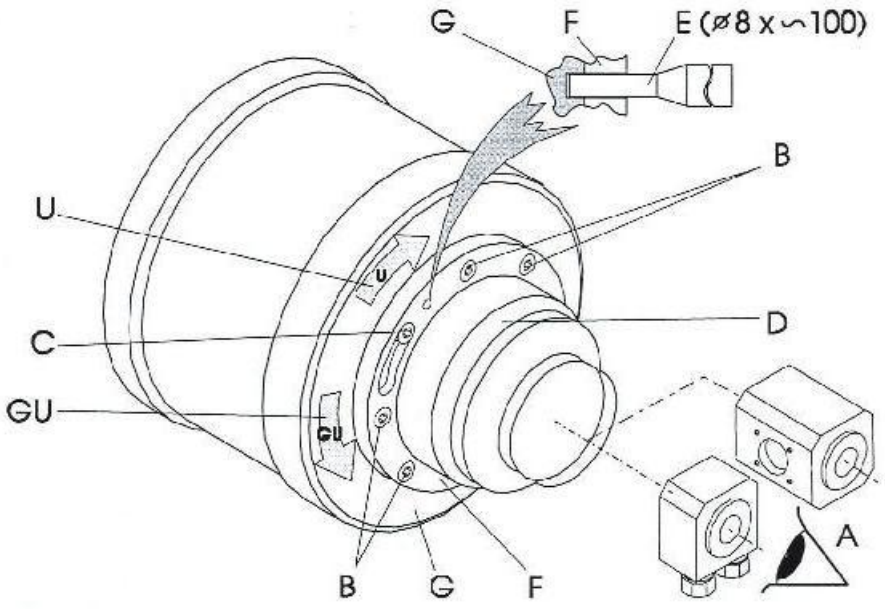
Clockwise rotation: the scroll turns clockwise with respect to the bowl, as indicated by the „U" arrow to the observer at point **(A)**.

Anticlockwise rotation: the scroll turns anticlockwise with respect to the bowl, as indicated by the „GU" arrow to observer at point **(A)**.

Procedure:

1. Remove 4 screws **(B)** with their washers
2. Only loosen the 2 screws **(C)** in the sector grooves. They axially position the rotation setting system **(D)** and must never be completely unscrewed.
3. Turn the rotation setting system in the direction required as the direction of rotation of the scroll. Insert the locking bar **(E)** in the hole marked with the required arrow (U = clockwise, GU = anticlockwise). Push it in until it engages in the corresponding hole on cover plate **(G)**.
4. Keep locking bar **(E)** in place and tighten two screws **(C)**.
5. Remove locking bar **(E)**.
6. Install 4 screws **(B)** with their washers.
7. Tighten 6 screws **(B+C)** to the required torque.

   Caution: Required torque is 40 Nm grade 12.9 screws



1.9 Start-up / Operation

1.9.1 Start-up: Before the first start, or after every dismantling of the ROTODIFF from the centrifuge, the following points should be checked:

1. Torque of the fixation bolts (or nuts) to the ROTODIFF flange
2. Run-out of the ROTODIFF (max. deflection)
3. Hose connections (especially that „P" and „T" are correctly connected)
4. If v-belts drive over ROTODIFF casing, check the v-belt tension
5. Check the port block for free movement, and ensure that the hoses, through twisting, are not causing forces on the port block

The ROTODIFF is now ready for start-up

Caution: The centrifuge must never operate without protection covers over the rotating parts in place.

The pump unit must run while the centrifuge is rotating, to ensure lubrication of the ROTODIFF system.

If the hydraulic connections still contain some air, allow the pump unit to run for a few minutes to expel air.

Check that the ROTODIFF operates normally, without pulsation or unusual noise.

1.9.2 Operation

The ROTODIFF scroll drive is a stable and reliable system, and will operate without problems, provided that the following points are observed:

Since the ROTODIFF is a hydrostatic unit, suitable for high torque operation, it requires clean oil, free from water contamination, and within the correct operating temperature range.

→ The correct start-up and shut down procedures should be observed.

→ The ROTODIFF operates while the centrifuge rotates.

→ If the centrifuge plugs, the ROTODIFF must produce torque. (The power pack oerates).

→ The pump unit must run before the centrifuge rotates.

→ The pump should only be stopped when the centrifuge is stationary.

1.10 Inspection and maintenance

Warning: **Spilt oil is an accident risk, and should be immediately cleaned up.**

1.10.1 Inspection

Operating staff must investigate faults or abnormalities without delay. Their cause must be established and remedied as soon as possible.

Inspection begins after the equipment is first put into service at the intervals indicated. All the inspection results should be logged.

1.10.2 Inspection schedule

Type of inspection	Interval	Purpose of inspection
visual	daily	ROTODIFF leaks
by feel	weekly	unusual vibrations
visual	fortnightly	strong pressure pulses at the pressure gauge
visual	monthly	hydraulic hoses
manual (with torque wrench)	six monthly	tightening of screws and bolts
contact VISCOTHERM AG or the LOCAL SERVICE CENTER	3 yearly or 15'000 hrs	Works overhaul is strongly recommended **Note:** Works overhauls are warranteed

1.10.3 Maintenance

The ROTODIFF should always be kept clean.

Caution: For cleaning the ROTODIFF use soap water and a brush. Never use high pressure or steam cleaners. Finally, slightly oil the surface to prevent rust.

Maintenance relates to proper care of the hydraulic fluid and to the regular replacement of filter elements. The maintenance frequency depends on the type of installation.

As experience shows, more than 80% of all failures in hydraulic equipment are a result of a wrong choice of hydraulic fluid and an improper care of the hydraulic fluid.

It is therefore of vital importance to give this area all the attention it deserves. Please consult list of approved fluids (SI-2) and the instructions by the equipment and fluid manufacturers.

1.11 Recommended spares

The spares list contains all the required spares with their reference numbers.

We recommend that all our customers have a stock of parts subject to heavy wear so that they can intervene quickly in the event of any failure.

For detailed prices of spares, please refer to our after sales service.

1.12 Pump unit requirements

1.12.1 Safety requirements

The pressure relief valve setting must never exceed the maximum pressure of the ROTODIFF (see 1.3 Technical datas, 300 bar)

Setting the relief valve must only be undertaken by trained personnel, and must be visually apparent (for instance, by a lead seal).

Note: The maximum pressure must be set at maximum flow capacity.

Electrical safety: The pump unit must be connected to ground (earthed).

1.12.2 Emergency functions

There are two types - operational and process.

Operational emergency functions are:

- ➔ Temperature control of the hydraulic oil (this results in an instantaneous shut down of the pump unit).
- ➔ Level control of the hydraulic tank oil level (this results in an instantaneous shut down of the pump unit).

Note: The instantaneous shut-down of the pump unit also „triggers" an immediate shut down of the process. To avoid this, alarms can be set before these emergency functions occur.

Process emergency functions:

- ➔ Drum shut down pressure (this will depend on the machine and the process conditions).
- ➔ Product pump shut down pressure (this will depend on the machine and the process conditions).

Note: These pressures can be set by the operator depending on operational conditions, but they must be set lower than the maximum system pressure - see valve shown on pump unit name plate.

1.12.3 Filtration

Filtration fineness is 10 µ absolute

Recommendation: ➔ The filter should be placed between pump and ROTODIFF.

➔ Use pressure-proof filter elements.

Note: The ROTODIFF tends to centrifugally separate fine dirt particles, and deposit them on the inside of the casing. This can reduce the lifetime of the unit, and thus filters with a bypass, or filters in the ROTODIFF to tank line, or the use of non pressure proof elements, should be avoided.

1.12.4 **Cooling**

The cooler efficiency should be controlled at regular intervals.

Note: If the oil temperature continually exceeds the recommended value (see 1.3 Technical data), the life of the ROTODIFF can be considerably shortened.

Every cooling system needs the correct maintenance (cleaning and checking).

1.12.5 **Environmental effects**

In extreme dusty or humid conditions, the following applies:

→ The tank filler cap needs to be a filtered type.

→ Installations where the pump unit is standing in the open air, or in extreme humid conditions, need special precautions to prevent water entering the oil system. Regular checks and, if necessary, oil changes may be necessary, as well as special sealing of the oil tank. Water in the oil will severely reduce the lubricating properties, damaging the pump and ROTODIFF by increased wear, and by the formation of rust.

1.13 Speed sensing

With the optional speed sensing system, bowl and differential speed can be displayed after processing of the speed signals.

This system comprises the necessary brackets, the sensors and connections, and the pulse generating discs.

Note: The speed sensing system can be installed on the original equipment, or be readily retrofitted in the VISCOTHERM works. Explosion proof sensors can also be fitted.

All relevant instructions on sensors (initiator) supplied by VISCOTHERM are contained in the SI-21. Appendix and in the spares list.

For details on how to connect the speed sensing system to the monitor, please refer to the display system manual.

1.0.3 Safety notices

Please read the following safety instructions CAREFULLY.

Make sure that all staff using the equipment are fully informed of its operating requirements. Keep this manual in a safe place.

Also make sure that all local and national safety standards are met.

Prior to any maintenance or repair work, ensure that:

- the hydraulic pump unit is not running
- the power leads to the electric motor are disconnected (withdrawal of fuses)
- the power supply to the control circuit via the hydraulic pump unit is cut off (with-drawl of fuses)

Prior to operating the equipment for the first time, ensure that:

- the equipment is correctly installed and wired up.
- hydraulic and cooler lines are correctly connected and sealed.
- the monitoring instruments operate correctly.

When maintaining or operating the equipment, watch out for:

- any unusual noises, vibrations or heat points.

After stopping the equipment, ensure that:

- the main switch is „Off" and locked in that position.

1.2 General functional description

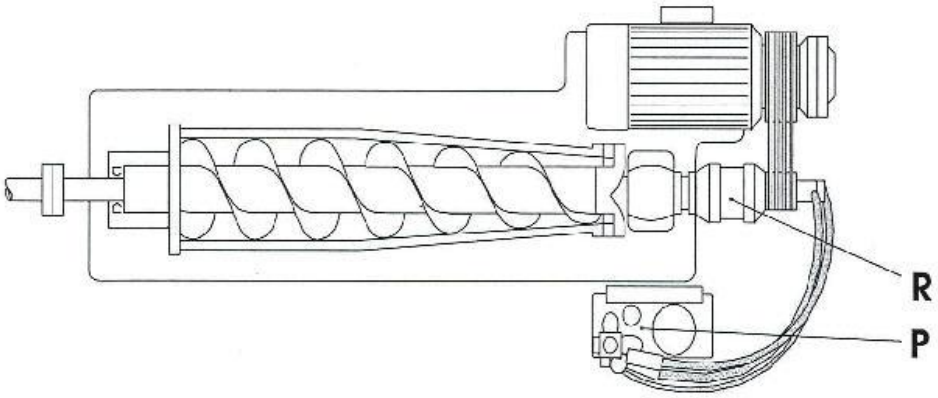
The pump unit supplies oil to the scroll drive unit ROTODIFF .

The ROTODIFF is a low speed radial piston hydraulic motor with a constant displacement. The pistons exert a tangential force on the cam, causing a differential speed between the bowl and the scroll.

The casing of the ROTODIFF is attached to the centrifuge bowl and the rotor is attached to the scroll.

The ROTODIFF contains a transfer seal, which permits the hydraulic oil to flow from the stationary to the rotating part..

With this drive system, the differential speed can be steplessly controlled, independently of the drum speed, during operation.



R: Scroll drive ROTODIFF
P: Pump unit

The torsional resistance of the scroll is indicated as hydraulic pressure. Thus the pressure gauge is showing the torque loading, which is directly proportional to the pressure.

By the regulation of the pump unit oil flow proportional torque regulation is obtained.

1.3 Technical data

C 45 - 100 K — Drg-nr. 0-600.1151/1

Dimensions:		1010 x 800 x 1320 mm
Tank:	Capacity:	160 l
	Medium:	see hydraulic oil list SI-2
Weight (without oil):		600 kg
Electric motor:	Size:	60 HP (1450 RPM)
	Build type:	364 TC
	El. protection:	IP 55
	Voltage:	3x575 V, 60 Hz
Pump:	Type:	Piston pump
	Displacement:	71,0 ccm/U
	Max. flow (60Hz):	88 l/min to 270 bar
Regulation type:		Analog
Max. normal sound level:		less than 83 dB (A)
Oil- water cooler:	Type for:	Drinking water, spring water, and process water (see manufacturing designations) max. 20° C, pressure max. 20 bar
	Water requirement:	max. 800 l/h
	Water connections:	G 1/2"
Control block:	Type:	C - DN 20 High pressure filter (element 240 l/min) Throttle valve Boost throttle valve Regulation stiffness throttle Manometer pressure gauge switc h Pressure balance valve Flow meter 110 l/min Electrical filter blockage indicator Thermostatic water valve
Level and temperature switch:	Switching contact 80 mm under MAX. marked level Temperature switching point 70°C	
Oil level indicator:	optical, with bulb thermometer	
Fixation:	4 anti-vibration mounts	
Hydraulic lines:	High pressure hose DN 20 (length 2500 mm) Low pressure hose DN 25 (length 2500 mm)	
Caution:	If hydraulic lines need to be longer than 7 m consult VISCOTHERM before installation	
Paint protection:	Painted in two component epoxy primer Top coat in RAL	

1.5 Preparations for start-up

Important note: Avoid introducing dirt into the hydraulic system. Work, if possible, in a clean-dust free area, taking care to clean all pipes and connections to avoid the ingress of dust and dirt. Use only clean, new oil. Always, upon removal of hoses, blank off the open end, so no dirt enters the system.

1.5.1 Positioning of the pump unit

For handy transportation of the pump unit it may be lifted with ropes by fastening them at the ring screws.

Make sure that the pump unit is securely fastened on the rubber mounting pads supplied.

1.5.2 ROTODIFF-drive (line connections)

From the pump unit to the fitting on the ROTODIFF (designated "P" connect the high pressure hose.

From ROTODIFF (designated "T") to pump unit connect the low pressure hose.

Never interfere with the "P" and "T" couplings as certain damage would result.

1.5.3 Oil- water cooler

Ensure that the water supply cross-section is not smaller than the entry connector in the cooler, so that the max. water flow can be achieved (see technical data).

Take care that, by closed water systems, the max. water pressure does not exceed 20 bar.

If the pump unit is located where the temperature can fall below the freezing point, then the cooler must be protected from frost damage (anti-freeze, draining, constant water circulation, etc.).

1.5.4 Filling with oil

The tank should be filled, through the filler / breather filter, with clean, filtered oil, see hydraulic oil list SI-2.

Fill the tank to the upper mark. After the first run, check, and if necessary, "top up".

1.5.5 Connecting the electric motor

After connection the wires to the motor junction block, check the direction of rotation of the motor (see arrow on the motor fan cover). Do not let electric motor run for more than a few seconds in the wrong sense, or damage to the pump will result!

1.6 Emergency functions and interlocks

1.6.1 Emergency functions:

The pressure settings p 2 and p 3, as well as the oil level and temperature switches fulfil an emergency function, and interlock with the control system.

The pressure point p 2 is interlocked with the feed pump, and the pressure point p 3 is interlocked with the main drive motor.

Note: The pressure settings p 2 and p 3 are integrated in the EC-240 control unit. This must be connected, according to the wiring diagram, to the external control circuit.

With the use of other control units (e.g. EMS/EPS etc.) the manometer pressure switches are used to switch p 2 (green flag) and p 3 (red flag). These must be connected to the control circuit according to the Service Information data.

when the p 2 is exceeded:

➔ Then the feed pump is cut-out.

when the p 3 is exceeded:

➔ Then the bowl drive is cut-out.

Important: The difference from p 2 to p 3 should not exceed 30 bar.

The level- temperature switch has two functions, these are:

Oil level in tank too low:

➔ Then the switches must, without delay, cut-out the pump unit drive motor, and then the bowl drive is cut-out too, with the feed pump.

Oil temperature exceeds 70 ° C:

➔ Then the switches must, without delay, cut-out the pump unit drive motor, and then the bowl drive is cut-out too, with the feed pump.

1.6.2 Interlocks:

➔ Firstly, a control voltage must be available, especially those units with electronic regulation.

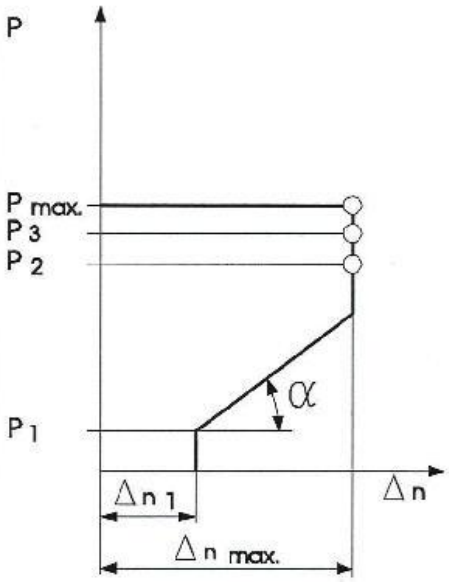
➔ The pump unit must operate before the centrifuge is run up to speed. On run-down, the pump unit must continue to operate until the centrifuge bowl has stopped.

➔ This ensures that, if the red flag cuts out the centrifuge drive, the ROTODIFF still exerts the maximum torque on the scroll during run-down.

It is recommended that these interlocks and emergency cut-outs are checked for operation before the first start-up.

1.7 Operation of the pump unit

1.7.1 Diagram of pressure / differential speed:



p_1: Pressure at which the differential speed is increased (set with boost throttle (15)). Start of regulation.

p_2: Pressure at which the feed pump is cut out (set with the green pressure switch flag, normally 230 bar).

p_3: Pressure at which main motor of centrifuge is cut out (set with red pressure switch normally 30 bar over p_2, not over 260 bar). In the case of the 260 bar value being not valid, this will be stated in data before delivery.

p_{max}: Maximum system pressure, (when reached, the pressure relief valve is opened and the differential speed is reduced to 0. The maximum system pressure is works set at 270 bar).

Δn_1: Base speed

Δn_{max}: Maximum differential speed

α: Rate of scroll speed increase (stiffness of regulation

The following rule applies: $p_1 < p_2 < p_3 < p_{max}$

The setting of the three basic parameters carried out as follows:

1.7.2 Adjusting for digital operation

In some cases, a product should be treated, where by the analog operating conditions are unsuitable. (For instance, product which does not cause torsional resistance, or extremely light suspensions, etc.).

In such cases, it is best to operate in the manual mode. Firstly, adjust the throttle valve (16) at the flattest value (screw out fully). Now the pump unit works in the digital mode. The differential speed must be readjusted on the valve (17) corresponding to the best solids dryness and centrate conditions.

On the boost valve (15), the boost point must be set. When the pressure exceeds this set point, the differential speed will be instantaneously increased, the centrifuge will be cleaned out of solids, before it „plugs".

The setting of the boost point should not be to high, in any case not over 100 bars.

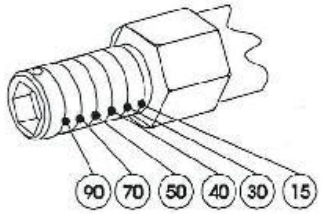
A few general points:

- This method of operation is hardly suited to continuos operation, when good results are required, because it is so personnel intensive. (Examining the results and adjusting valve (17)).
- The emergency boost effect is not a form of regulation. It may occur, with very light suspensions hardly producing torsional resistance, if a complete solids filling of the machine takes place and hinders any sedimentation, without the emergency boost effect taking place. The emergency boost effect simply prevents plugging of the machine when considerable fluctuations of feed conditions occur.
- When analog operation exists, and a change to digital operation is foreseen, then note exactly all regulation parameters to avoid time consuming readjustments.

1.7.3 Adjusting for analogue operation

Here, a continuous adjustment of the differential speed dependent on solids loading is achieved.

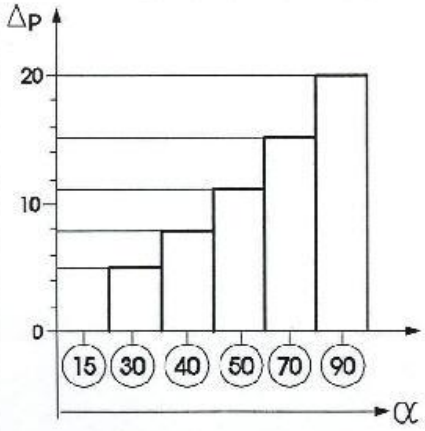
The stiffness of regulation is the ratio of differential speed increase to pressure increase. To simplify, this value is stated as the pressure range which is needed for the full flow range from Δn_1 – „0", to Δn_{max}



On the shaft of the throttle screw (16) are six rings. The pressure range is set by adjusting the throttle screw until the corresponding ring mark is visible. For instance: 40 (over a pressure range of 40 bar), the differential speed will range from zero to max.

The higher this value is, the steeper the slope angle α.

For any given setting of the of regulation point, a change in regulation slope angle α will affect the regulation threshold p_1.



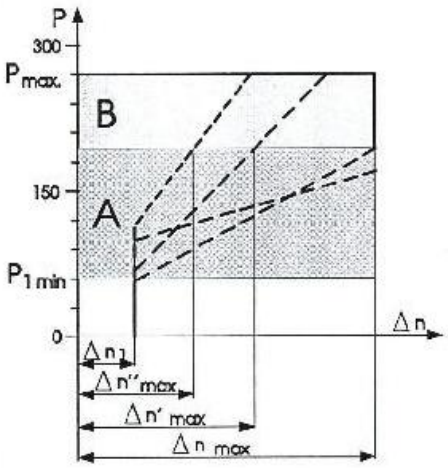
The diagram shows correction values for the regulation threshold in dependence of the stiffness of regulation α. For example: an increase of regulation stiffness from 30 to 90 bar increases the regulation threshold p_1 by 15 bar without adjusting the regulation throttle (15).

1.7.4 Pressure range

Lowest pressure setting: 50 bar (regulation threshold must not be lower!). At a lower pressure no regulation dampening occurs; unstable regulation results.

The highest boost point setting on the valve (15), is approx. 270 bar. Higher values are hardly realistic, since the working pressure is moved too close to the maximum pressure.

The average continuous working pressure should not exceed 180 bar. The upper limit for the working pressure is 200 bar (see A). The emergency pressure range is between 200 and 250 bar (see B). In this range the process must be interrupted by:



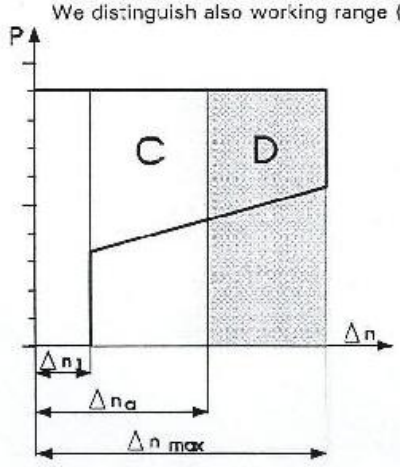
1. Cut-out of feed pump (p_2)
2. Cut-out of main drive (p_3)

In the case where 220 bar is not at the end of regulation, then the max possible differential speed is respectively reduced. Although the differential speed above 220 bar increases, the max differential speed, Δn_{max}), for safety reasons, is defined at 220 bar.

It follows that: $\Delta n_{max} > \Delta n'_{max} > \Delta n''_{max}$

1.7.5 Scroll speed range:

We distinguish also working range (C) and an emergency range (D). The following rules apply:



$\Delta n_1 \geq 1/3\ \Delta n_a$

and

$\Delta n_a \leq 0{,}6\ \Delta n_{max}$

If the last condition is not fulfilled, blockage of the centrifuge may result, as the differential speed increase is insufficient to clear the machine.

Practical advice:

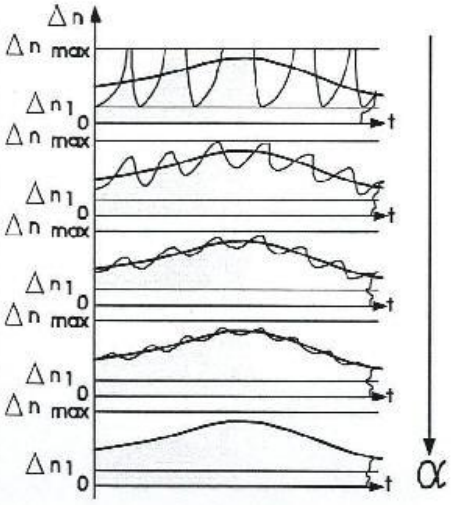
Setting operations should commence when the oil has reached working temperature 40° C: testing and calibrating temperature of the control system.

Rule 1.
- When in doubt select a high base speed setting.
- If the base speed is too low blockage may occur, especially if the solids feed loading rapidly increase.
- If the base speed is too high the scroll cannot generate enough torque for regulation.

Attention: Never turn back the base speed to zero, when the system is regulating, since when the machine returns from regulation to base speed, blockage will occur.

Rule 2
- A low regulation threshold setting is preferable.
- At a low regulation threshold setting the solids output is too wet (due to insufficient solids loading of the centrifuge).
- If the regulation threshold setting is too high, the machine is overloaded with solids. Consequences: danger of blockage.
- Quality of recovery deteriorates, since the working range is too close to the emergency condition.
- Light suspensions, i.e. light voluminous solids, which produce no high scroll torque, require that the regulation threshold should lie under the pressure at which, normally, the machine is at the limit of solid loading. Should this limit be exceeded, the machine „tips", i.e. no solids output, the product simply flows, without sedimentation, through the machine.

Rule 3
- The regulation stiffness should be set so that, the regulation is just stable. The less the stiffness, the more the tendency to over-react, that means: the more brutal the reaction of the regulation, the more the level of filling of the machine is reduced.
- Since the filling rate of the machine depends on the infeed solids, the working conditions can thus oscillate.



The diagram opposite, shows how an increase of regulation stiffness stabilizes the working conditions. The heavy line portrays the rate of solids input in the machine. This oscillation can be observed on the flow meter (22) and also on the manometer pressure switch (8). Should the regulation stiffness far exceed the stable value, the level of filling is increasing when the feed input increases. The same effect occurs when the regulation threshold is too high. Basically, a high regulation stiffness is required with heavy and easily transportable solids in the machine and vice versa.

Note: Products which cause „chatter" (polysaccharides, sulphur, coagulated blood etc.) will not react to changes in the regulation stiffness.

„Chatter" vibrations can be reduced by changing the impedance of the hydraulics system: a VISCOTHERM expert will advise.

Finally, two important rules of behaviour:

Rule of patience: - The machine needs a certain time to adapt to the changing of the regulation parameters. This adaption time-lag increases with the size of the machine.

Rule of simplicity: - A small number of control possibilities leads to a simple and safe system. Normally the operating-crew should only adjust the regulation threshold, based on the following results:

- **Should the cake be too wet: increase the regulation threshold**
- **Insufficient recovery: reduce the regulation threshold**

The level of the working pressure should not exceed 220 bar. The average conti-nuous working pressure should not exceed the value of 180 bar. These values have to been supervised by the operating-crew.

All the others adjustments like:
- base speed
- regulation stiffness
- setting of pressure switches

should not be changed by the operating-crew.

It is advisable to write down these adjustments.

1.8 Maintenance

1.8.1 Check daily:

- Filter blockage indicator
- Operating temperature

1.8.2 After first 200 working hours:

- Filter change
- Check for leakage on pump unit (and ROTODIFF)

1.8.3 Every 4000 working hours or every six months operation:

- Oil change
- Clean suction strainer
- Filter change
- Oil tank cleaning
- Check for leaks

Recommended: Efficiency check on pump unit

Shell and tube cooler: Recommended working temperature of the hydraulic oil 40 - 50 ° C

- With hard water, the cooling element should be periodically flushed with diluted formic acid.
- With water contaminated with organic substances, cleaning periodically with steam is necessary.
- The frequency of cooler cleaning is indicated by the cooling effect obtained. Compare inlet and outlet water temperatures.

Note: In the case of very dusty, humid or high ambient temperatures in the operational area, it is advisable to shorten the service interval. VISCOTHERM will advise.

Where input cooling water temperature is over 20° C consult VISCOTHERM for cooler-change.

If the pump unit is exposed to ambient temperatures below 0° C ensure that the cooling water does not freeze (empty cooler or add anti-freeze, ensure continuous circulation).

Caution: The level- and temperature switch (9) exists for emergency situations. Pump units and ROTODIFF's which run too hot will experience a high rate of wear and a short life between overhauls.

1.8.4 Works revision of pump and ROTODIFF:

The frequency at which the works revisions should be undertaken will depend upon the application (working pressure, ambient temperature etc.).

This will be indicated by a drop in the efficiency of the pump or the slip-drive ROTODIFF, as checked during routine servicing.

Overhaul work on pumps and ROTODIFF's can be undertaken either at our factory in Switzerland, or by one of our authorised repair facilities. Contact VISCOTHERM for the address of your nearest repair workshop.

1.9 Recommended spares

The spares list contains all the required spares with their item numbers.

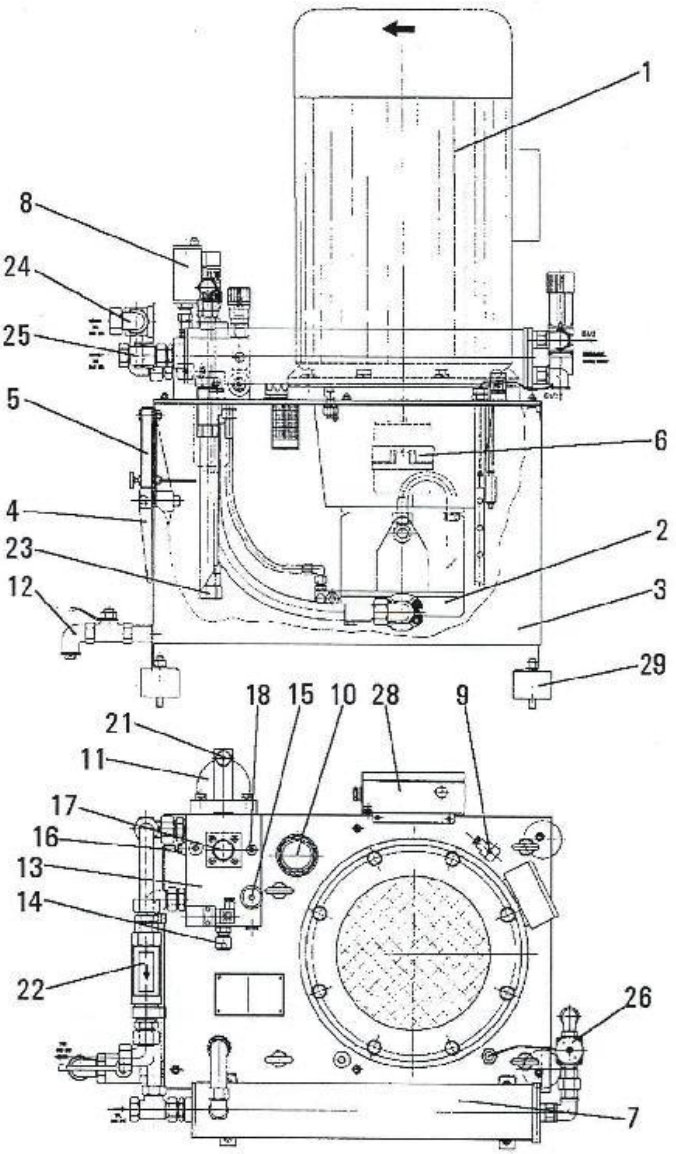
We recommend that all our customers have a stock of parts subject to heavy wear so that they can intervene quickly in the even of any failure.

For detailed prices of spares, please refer to our after sales department.

1.10 Pump unit - Drawing with items and denomination

Legend:

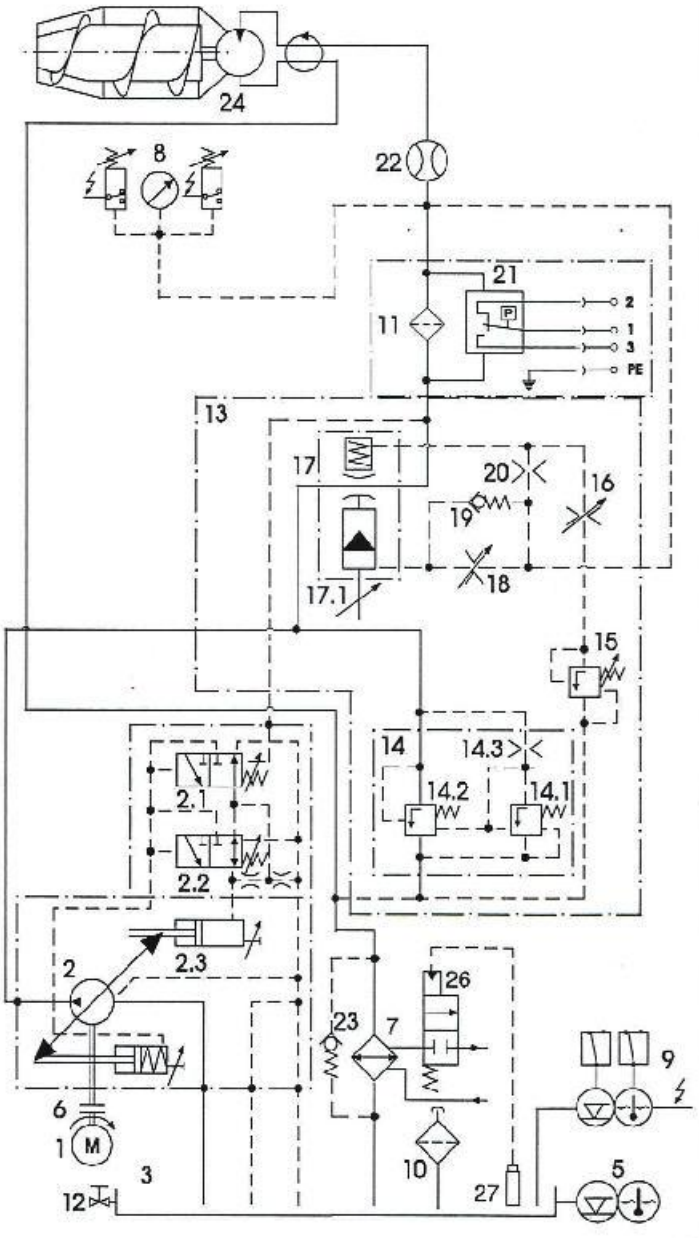
1	Electric motor
2	Axial piston pump
3	Oil tank
4	Cleaning cover
5	Level and temperature indicator
6	Coupling
7	Oil- water cooler
8	Manometer pressure gauge switch
9	Level and temperature switch
10	Filler / breather filter
11	High pressure filter
12	Drain cock
13	Control block
14	Pressure balance valve
15	Boost throttle valve
16	Regulation stiffness throttle
17	Throttle valve
18	Throttle valve
21	Electrical filterblockage indicator
22	Flow meter
23	Cooler check valve
24	HP-Fitting to ROTODIFF
25	HP-Fitting from ROTODIFF
26	Thermostatically controlled water valve
28	Junction box
29	Anti-vibration mount



1.11 Hydraulic scheme

Legend:

1	Electric motor
2	Axial piston pump
2 .1	Oil flow controller
2 .2	Pressure control valve
2 .3	Control spool
3	Oil tank
5	Level and temperature indicator
6	Coupling
7	Oil- water cooler
8	Manometer pressure gauge switch
9	Level and temperature switch
10	Filler / breather filter
11	High pressure filter
12	Drain cock
13	Control block
14	Pressure balance valve
14 .1	Pilot control to pressure valve
14 .2	Pressure relief valve
14 .3	Primary throttle
15	Boost throttle valve
16	Regulation stiffness throttle
17	Throttle valve
17 .1	Vernier to throttle valve
18	Throttle valve
19	Anti clapet valve
20	Primary throttle
21	Electrical filterblockage indicator
22	Flow meter
23	Cooler check valve
24	ROTODIFF
26	Thermostatically controlled water valve
27	Temperature sonde



2.0 Service information	Origin: / Verification: / Release:	SI - 2 e	Page 1 of 6
Type: **2.1 Hydraulic oil list**		D.Nr.	
Note: SI-2 replaces all previous oil lists		Date: 12.01.1999 / WG	

Application: Use only HLP-hydraulic oils for VISCOTHERM units.

Specification: to DIN 51'524, T2 HLP 68 / ISO 6743/4 L-HM 68
(FZG - damage force rating > 11)

Viscosity: to ISO VG 68 * (* = Nominal viscosity in mm^2/s at 40 °C)

Properties: Hydraulic oils HLP are mineral oils with additives for improvement of anti-corrosion properties, anti-ageing, and improved performance under boundary lubrication conditions (anti-seize additives).

VISCOTHERM recommends the following hydraulic oils:

Manufacturer	Brand name
SHELL	TELLUS 68
ESSO	NUTO H 68
MOBIL	DTE 26
AGIP	OSO 68
CASTROL	HYSPIN AWS 68
TEXACO	RANDO HD 68
i.d.	ANUBIA EP
CITGO	A/W HYD OIL 68

(This lists some approved oils only. We reserve the right to change it.)

Caution: Other hydraulic oils should only be used with written confirmation that the oil conforms to the above specifications.

Note: Environmentally friendly oils can be used for VISCOTHERM drives. The applications, specifications, properties, recommended products and storage needs are listed in **Service Information sheet SI-60.**

The manometer pressure switch with gauge is a combined unit, which can be mounted in any convenient position. It contains a permanent system pressure gauge, together with two switches with visible setting flags, which can be independently adjusted over the whole pressure field, which is 0 - 400 bars.

The electric plugs are to DIN 43650 and can be mounted in three positions, 90° to each other. The switches are classified IP 54 insulation.

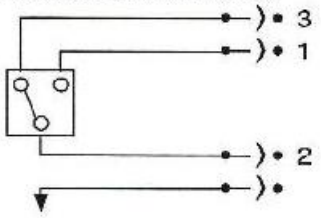
Maximum switch capacity:

Alternating current	2,5 A,	220 V
Direct current inductive	2,5 A,	30 V
Direct current resistive	5,0 A,	30 V

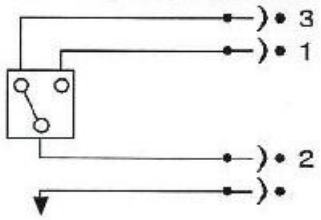
Note: Use only in ex proof applications together with tested; intrinsically safe relays

Connections diagram:

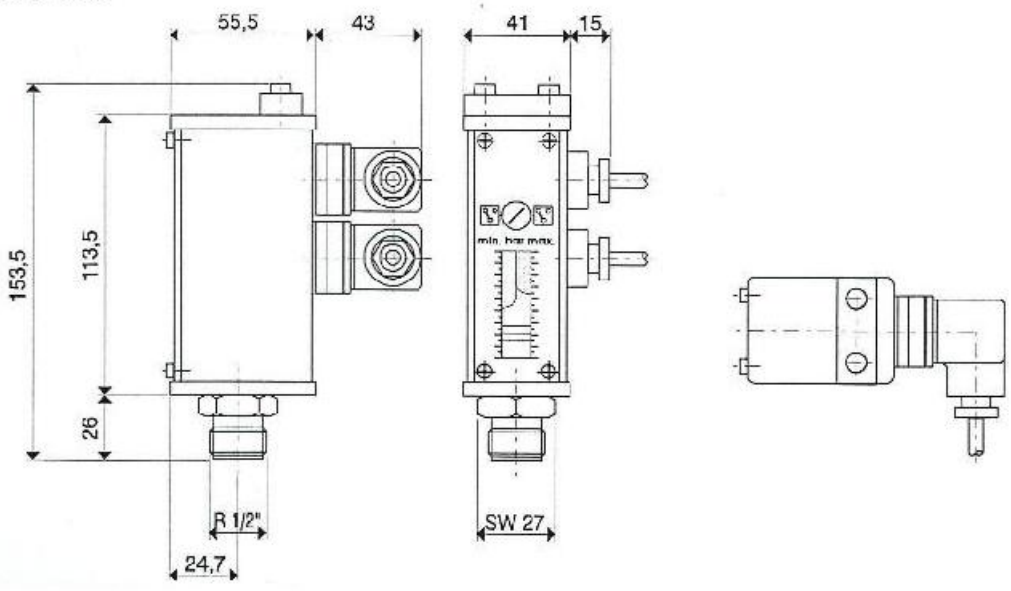
Maximum pressure: red tab



Maximum pressure: green tab

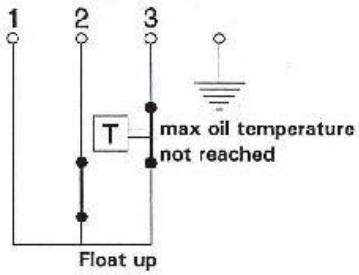


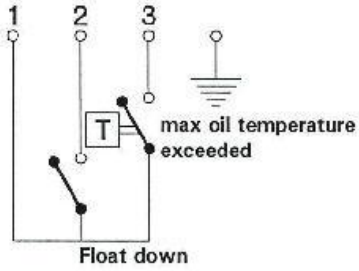
Dimensions:



Technical data:

Threaded size		M20 x 1,5
Mounted position		senkrecht ± 10°
Instrument plug		DIN 43 650
Electric protection		IP 65
Switching voltage	level	max. 220 V ~
	temperature	250 V ~
Switching current	level	max. 0,8 A
	temperature	2,5 A
Switching capacity	level	max. 20 W / 26 VA
	temperature	110 VA
Temperature hysteresis		max. 25°C
Temperature accuracy		± 10 %
Temperature switching point		70°C
Contacts		normally closed





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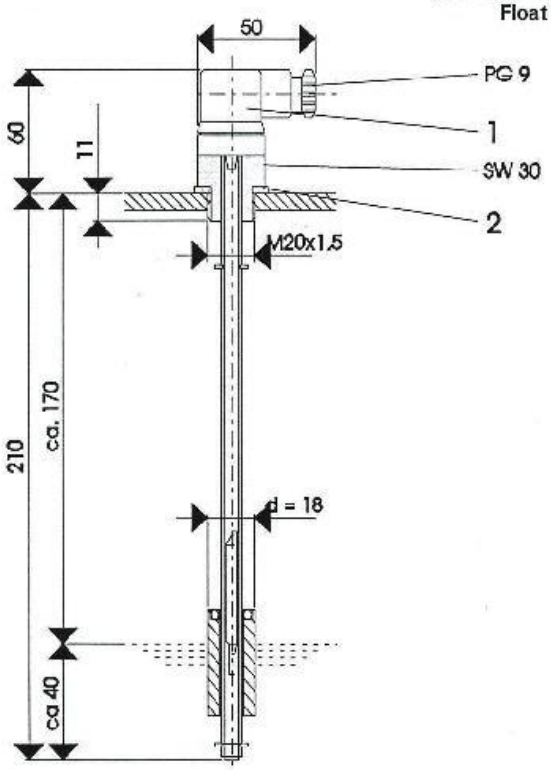


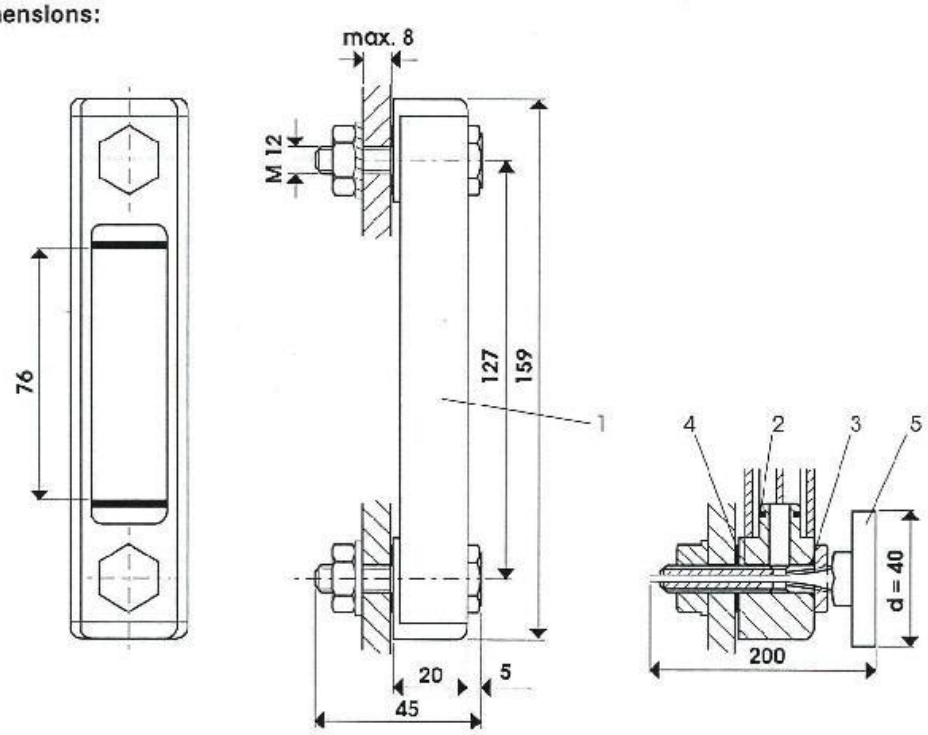
Item 1 = 619 Level and temperature switch cpl.
Item 2 = 6144 PA-sealing ring (20/30x3mm)

Fluid level gauge with integral temperature gauge for hydraulic oil tank.
(The oil temperature can read on a degree centrigrade or grade to F-scale).

Designation: **FSA 127 . 1 . 1 / T 12**

- Level gauge
- Dimensions
- Seals (material)
- Modification number
- Thermometer (5)
- Hollow screw (M12)

Dimensions:



VISCOTHERM-Article-nr.:	Item:	Designation:
625	1	Level and temperature indicator cpl.
6304	2	O-ring (13x2,5)
6305	3	O-ring /12,3x2,4)
6306	4	Sealing ring
6307	5	Thermometer

The filter blockage indicator is used with high pressure filters. It signals when the pressure drop over the filter exceeds a certain value.

General details:

Type of filter blockage indicator	VD-8.C.0
Weight	150 g
Type of indication	electric

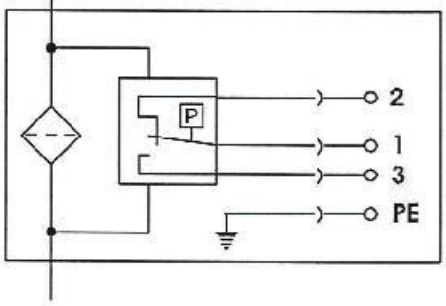
Hydraulic details:

Pressure indication range	8 bar ± 10 %
Perm. working pressure	420 bar
Perm. temperature range	-10 ° C bis + 100 ° C

Electrical details:

Switching type	opening or closing contacts
max. voltage	230 V
Electrical connection	plug connection PG 11, socket to DIN 43650
max. switching output at resistive load	100 VA / 60 W
Switching capacity	ohmic 3 A bei 24 V = ohmic 5 A bei 230 V ~
Protection type	IP 65

Symbols:



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